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NOTES ON THE EXPLORATION AND THE GEOGRAPHY OF THE NORTHERN SELKIRKS, BRITISH COLUMBIA

BY

HOWARD PALMER
Secretary of the American Alpine Club

(Map facing p. 256.)

That the territory occupied by the northern portion of the Selkirk Mountains has so long remained unexplored from the standpoint of geographical science is a rather striking illustration of the influence which topography exerts upon the trend of human activity. Entirely surrounded by well-defined routes of travel—the Canadian Pacific Railway on the south and the Columbia River sweeping through its "Big Bend" on the northeast and west—the tract has offered slight inducement to exploration for additional channels of communication, while to nearly all save trappers and prospectors its steep mountain walls and forest-choked valleys have proved disheartening barriers.

It is the purpose of the present paper to outline the more important of the earlier explorations that have thrown light upon this area and then to set forth briefly certain data concerning its internal topography noted by the writer in the course of several recent journeys.

I. EARLY EXPLORATIONS

Prior to the construction of the Canadian Pacific Railway what little east-and-west traffic existed across this portion of British Columbia was carried on by the agents of the great fur companies*

* "The Dominion at the West" by A. C. Anderson, Victoria, 1872, p. 1.

and followed the obvious route around the northerly end of the range afforded by the valley of the Columbia River. That this involved a detour of about one hundred and fifty miles from a direct line was not a serious objection when the way was comparatively clear and free from untoward hardship. It was not until the commencement of systematic exploratory surveys for a railroad to connect the Crown Colony of British Columbia with the rest of the Dominion that serious efforts were made to find a straighter path across the mountains.

Probably the earliest attempt of this nature was that undertaken by Walter Moberly, C.E., in 1865. In the course of a march easterly from Shuswap Lake, having discovered Eagle Pass through the Gold Range, he pushed on in the same direction up the Illecillewaet River on the opposite side of the Columbia to the forks of the stream. Here the refusal of his Indians to complete the crossing of the range even if a pass were found at the head of the easterly branch as he thought probable, made it useless for him to continue thither, and the northerly branch was entered instead. This failed to furnish the desired pass, so he returned to his starting point forthwith. Before leaving the Columbia, Moberly had detailed an assistant to proceed up that river to investigate the possibilities for a pass at the headwaters of Gold Stream, an important easterly (left) tributary, but this attempt was also unsuccessful. Both expeditions reported that "the valleys in places are very narrow and the mountains on both sides steep and subject to heavy snowslides."*

Before passing to the later operations of the railroad surveys, we may pause for a moment to refer to the discovery of gold along the easterly tributaries of this portion of the Columbia in 1864-5, which gave the section a wide prominence and resulted in a certain opening-up of what had previously been an unknown wilderness. A rush of prospectors at once set in, particularly from the Cariboo district across the Gold Range, and a scene of considerable excitement ensued. Log towns were built, mines were opened, and in the course of several years as much as $300,000 worth of gold was produced, but owing to the remoteness and resulting difficulty in bringing in sufficient supplies the diggings were finally abandoned. The principal placers were located along the bottom lands of Gold Stream, Downie Creek, Carnes Creek and their branches.† One might naturally suppose that the vicinity would have been scoured far and

*"Report to Surveyor General of British Columbia" by Walter Moberly, C.E., *British Columbia Gazette*, December 23, 1865. This is accessible in the Provincial Secretary's office, Victoria, B. C.

†For an account of a trip into this region twenty years later (1885) see "The Canadian Rockies: New and Old Trails" by A. P. Coleman, New York and London, 1911, pp. 60–78.

wide by these adventurers, but such does not seem to have been the case owing to the extremely difficult nature of the country.*

In 1866 Moberly extended his explorations to include the easterly borders of the Selkirks by a traverse of the Kootenay valley and of the Columbia valley from the headwaters of that river to the Big Bend. He was thus in the best possible position to grapple with the baffling enigma of a suitable location for the railway across the range, when in 1871 he was appointed district engineer of this section. During the winter of this year he accomplished the first known crossing of the chain. Proceeding on snow-shoes down the Columbia River from a point near the mouth of the Blaeberry on the easterly side of the Selkirks, the party turned up Gold River† and followed it to the headwaters. There they discovered a high pass during the passage of which they were "nearly buried beneath an immense avalanche that came roaring down the steep mountainside when we [they] were near the summit." Continuing westward "after a very fatiguing journey" they reached the nearly deserted mining town on French Creek presumably via the valley of Gold Stream.‡ The expedition thus meagerly described seems to mark the end of Mr. Moberly's work in the range. He was undoubtedly the first to acquire a comprehensive knowledge of its topography, which few, if any, subsequent travelers, even present residents of the province, have equaled. The difficulties and dangers involved in such pioneer work among these savage mountains can scarcely be appreciated short of personal experience, and it is well within the truth to state that lesser accomplishments in the world of exploration have received wider recognition.

Owing to various circumstances which do not concern our present purpose the attack on the Selkirk problem was allowed to lapse during the next few years. Its final solution was not officially achieved until 1881, when Major A. B. Rogers, retraversing Moberly's line of march of 1865 up the Illecillewaet River to the forks and continuing thence along the easterly branch, reached the long-sought pass, now well known as Rogers Pass, exactly as predicted by Moberly at that time.§ An instructive illustration of the nature of

* "Mineral Wealth of British Columbia" by George M. Dawson, *Annual Report of the Geological Survey of Canada*, Vol. III, 1887–88, p. 40 R.

† Gold *River*, a left affluent of the northwest-flowing portion of the Columbia, into which it empties in 51° 43′ N., should not be confused with Gold *Stream*, just referred to, a left affluent of its south-southeast-flowing portion which it joins in 51° 40′ N. With regard to the terminology cf. *Geogr. Journ.*, Vol. 37, 1911, pp. 178–179. ASST. EDITOR.

‡ These extracts are quoted from a pamphlet by Mr. Moberly entitled "Early History of C. P. R. Road," pp. 8 ff., to which the writer is indebted for many other facts as well. See also his "The Rocks and Rivers of British Columbia," with map and illustrations, 1885.

§ It is stated in the pamphlet referred to that Albert Perry, an assistant of Moberly, reached this pass in 1866 by way of the Illecillewaet valley.

the obstacle presented by the Selkirk chain is found in the fact that the adoption of this route, the last link in the line, occurred only three years before the passage of the first transcontinental train in November, 1885, when the location had been perfected across the loftier main Rocky Mountain range and the road was in operation as far west as Calgary.

The selection of this route naturally removed the incentive for systematic exploration to the north, and the further efforts made were confined to the development of its immediate vicinity. Accordingly it has resulted that the interior of the tract under consideration has remained essentially in its primeval obscurity undisturbed by the passage of nearly a century's travel around it via railroad and river. It is unmapped in detail, and, save for the principal streams, its features are for the most part nameless.

II. Recent Explorations*

Passing now to the latest work among the northern Selkirks, allusion may be made to the expeditions of P. A. Carson, Dominion Land Surveyor, in connection with the governmental triangulation of the "Railway Belt." In 1906 and 1907 he pushed northwesterly from the railroad and extended the mapped territory to include the North Fork of the Illecillewaet River and most of Gold River. The work was in the nature of a reconnaissance to select suitable stations for the triangulation, and, accordingly, the reports† as far as they refer to the topography of this section are mainly of a general character, though they afford valuable information within their scope.‡

*Under this heading it is appropriate to include the subjoined note by the Assistant Editor, though when the following portion of the paper was written it was not intended to do more than to present, besides the writer's narrative, the salient results of the government surveys with respect to the interior geography of the Big Bend region. All reference to other and presumably less important exploratory work in the Columbia Valley, along the railroad, or in territory immediately contiguous to them, is forbidden by limitations of space. Consideration of this work is deferred to a subsequent paper. With respect to the ascent of Surprise Mount referred to below, it will be of interest to alpinists to note that the trip is probably the first recorded ascent in the northern Selkirks.

Note.—Mention should here be made of Professor A. P. Coleman's explorations in this region. In 1888, in the first of his attempts to reach Mts. Brown and Hooker, which finally resulted in establishing the falsity of the extreme altitudes with which they had been credited, he made a journey by canoe and raft from Beavermouth down the Columbia, past Surprise Rapids (below the mouth of Gold River) to Kinbasket Lake, whence he was forced to return because of insufficient provisions. On this journey he ascended a mountain on the left bank of the Columbia overlooking the rapids, which he named Surprise Mount. It is probably not far from the "Mt. Stockmer" of Mr. Palmer (*Geogr. Journ.*, Vol. 37, 1911, p. 172). References to Professor Coleman's journey will be found in Part III of the book referred to in the note on p. 242 and in his paper, "Notes on the Geography and Geology of the Big Bend of the Columbia," *Proc. and Trans. of the Royal Soc. of Canada for . . . 1889*, Vol. 7, 1890, Section IV, pp. 97-108. Asst. Editor.

† See *Annual Reports of the Topographical Surveys Branch* covering the years 1906, 1907, 1908, and 1909, Appendices 17, 18, 18 and 13 respectively, by P. A. Carson, D. L. S., with maps.

‡ In 1902, during the course of a survey of the mountains along the railroad for the Dominion government, Arthur O. Wheeler, D. L. S., determined the altitudes of two important mountains well within the region under discussion: Mt. Sir Sandford, 11,634 feet, and Mt. Iconoclast, 10,618 feet. Vide his Selkirk Range," Vol. I, pp. 74-75.

The first ascents of Mt. Sorcerer and of a peak situated between the south and the main branch of Gold River called Mt. Sonata (*ca.* 9,800 ft.) are worthy of mention, for both expeditions must have been arduous for men cumbered with surveying instruments and accessories.

During the summer of 1911 the writer, in company with Professors E. W. D. Holway and Frederic K. Butters of the University of Minnesota, made two journeys into the heart of the Selkirks north of the railroad. Our objects were largely those of the mountaineer, but at the same time we planned to adopt such routes and ascend such peaks as would throw all possible light upon the topography both within and beyond the limits previously covered. In particular we desired to trace the water-parting of the range which forms the boundary between the districts of East and West Kootenay,* to locate the passes and generally to untangle as far as we could the exceedingly complicated drainage system. In addition we counted on carrying out a rough survey with transit and camera along with certain glacial, botanical and other scientific observations. The following paragraphs present a brief description of some of the salient orographical features observed.

Our first expedition, starting from Beavermouth in June, descended the Columbia by canoe and turned up Gold River, its first large westerly tributary, as Moberly had done in 1871. We pushed to the limit of navigation by boat and then continued with pack harness. Leaving the main valley for that of the west branch of the river, a base camp was finally established at its source near Sir Sandford Glacier on June 14, where the party made its headquarters for the following five weeks. Supplies were relayed in by two porters.†

For three weeks nearly continuous rain kept us under canvas, but then the storm cleared and with favorable weather we made a week's trip to a valley lying to the southwest beyond the basin of Sir Sandford Glacier about five miles away. From here we ascended an isolated peak (9,400 feet),‡ some three miles further off, commanding the westerly side of the range. This formed an important station, for being situated in the point of the V between the northerly and easterly branches of Gold Stream, it covered these and a considerable

* *Report of Minister of Mines for British Columbia*, 1899, p. 570.

† Detailed reference to this vicinity is omitted since information is already available. See the writer's "A Pioneer Reconnaissance in the Northern Selkirks," *Appalachia*, Vol. 12, No. 1, July, 1909, pp. 16-30, and "Explorations about Mount Sir Sandford, British Columbia," *Geogr. Journ.*, Vol. XXXVII, 1911, pp. 170-179.

‡ The heights mentioned in this paper are estimates based on aneroid readings unless the context indicates otherwise.

reach of the river below the forks as well. Goldstream Mount is suggested as an appropriate name.

To the west, numerous sharp, well-timbered ridges, seldom reaching far above snow-line, succeeded each other in a diminishing series towards the broad valley occupied by the Columbia. Further off along its western bank the Gold Range with its long array of snowy summits was plainly in view stretching far to the north and south.

Northwesterly, the continuation of the Selkirks presented a characteristic complex of sharp, glacier-bearing summits (Fig. 1), varying

FIG. 2—View south from Gold Stream Mt. showing Mt. Sorcerer on the left and Mt. Holway on the right about 15 miles away across the valley of Gold Stream.

chiefly in a lessened altitude from the more familiar portions of the chain. At two points, however, elevations of not less than 10,000 feet stood out, one a knot of four peaks since plotted as situated between the headwaters of Big Mouth and French Creeks, for which the name Mt. Dentiform is suggested, the other apparently forming a long even-crested wall along the westerly bank of Windy River. Immediately at our feet on this side flowed the north fork of Gold Stream, taking its source in part from the westerly glaciers of the

Austerity group. Below these, a narrow pass cut through to what we saw later was a north-trending valley, a branch of Windy River just mentioned. Thus the divide was determined at this point. It is worthy of note that here it approaches within seven miles of the Columbia giving a disproportionately long westerly slope to the range. Towering over all, the relentless peaks of the Austerity group presented an impressive ensemble of chocolate-hued cliffs and pinnacles.

Northeasterly in the direction whence we had come the snowy scene was entirely monopolized by Sir Sandford and his attendant satellites. Easterly in the distance we looked through a pass at the head of one branch of the east fork of Gold Stream, and we at once selected this as the objective of our next excursion, since it occupied the most probable position for the pass by which Moberly had made the first crossing of the mountains as above described. Turning to the southeast and south (Fig. 2), the range continued in a hopeless maze of snowfields and glacier-scarred peaks, among which we recognized Mts. Iconoclast and Sorcerer. A few miles to the west of the latter, a throng of striking summits claimed our admiration, out-topping everything in their immediate vicinity. It was apparent that from any of these the view towards us would be most instructive topographically. Westerly again came the forested ridges extending towards the Columbia, drained in this quarter by Downie Creek. The remarkably long ridge dividing the basins of Downie Creek and Gold Stream culminated in a handsome, sharp, rocky spire which soared above these valleys from the midst of a complicated group of lesser mountains. It is designated on the accompanying map as Mt. Arrowhead, and appeared to be not far from 10,000 feet high. The valley of Gold Stream in this direction is heavily timbered, and the river wanders in intricate meanders among swamps and beaver meadows.

From our camp the following day, we made our way across a snowy pass and a smooth névé, descending over its easterly effluent to the supposed Moberly Pass. From the edge of the névé we saw that it was a long, sparsely timbered saddle to which open meadows and rushing streams, fed by many melting snow-banks among the evergreens, gave a pleasant park-like appearance. As we descended the glacier, the questions arose: Which way does the drainage from the southerly tongue of Sir Sandford Glacier run? Is Citadel Mountain on the divide or not? Our interest and expectancy were keen as we followed the stream downwards along its cascade. Not till we reached the pass itself was the matter clear (Fig. 3). There

we saw that the stream curved abruptly to the east forming the source of Gold River and placing Citadel, Sir Sandford and Sir Sandford Glacier on that side of the divide. We were slightly below the actual water-parting and soon hastened up a rivulet to locate the very place. This we found about a quarter of a mile beyond (alt. 5,900 feet) where another glacial brook ran down onto the pass from the same side and then swung sharply west. In this direction the valley dropped away abruptly and the stream cascaded. From the high névé that we had crossed earlier in the day a glacier descended tumbling apparently out of the sky and breaking over a cliff in a magni-

FIG. 3—View west up the main branch of Gold River. Mt. Citadel at the right 8 miles distant; Moberly Pass at the head of the valley.

ficent ice-fall for more than 1,600 feet. At the bottom, the stream was reconstructed in two tongues on either side of a rocky cleaver. The whole formed one of the finest and most instructive examples of glacial activity to be found in the range.

After carefully studying our surroundings, we felt no doubt but that this was Moberly Pass. It was the most direct route connecting any of the branches of Gold River and of Gold Stream below timberline, and, as Moberly had reported, it appeared obvious that a tunnel would have been necessary for a railroad following this route across the range owing to the steepness of the westerly approach. The pass was similar to Rogers Pass in size and extent, though without

as many lofty peaks in view about it. Mt. Sir Sandford was concealed by the ice-fall in that direction. A buttress of Mount Citadel (9,580 feet) and a nameless peak of about the same height to the southeast were the most prominent mountains in the prospect. On the south side extensive névés occupy a higher plateau from which several tongues protrude and all but reach the pass. Only the largest of these, however, is visible from below. It is a rather significant fact that all the branches of Gold Stream and of Gold River correspond almost exactly at the various passes without any interlacing of their courses.

Shadows falling on the pass warned us to curtail further investigations, attractive though they would have been, for a whole range intervened between us and our evening meal. Accordingly, about four o'clock we struck upwards through the woods to regain our morning's route. We climbed into the sunshine an hour or two later, which, suffusing the entourage of glacier and peak with a golden radiance, brought out a picture of surpassing loveliness.

Returning to Sandford camp, the only further trip from this point that need be referred to in detail (though each of the other six climbs to above 9,000 feet yielded either new or confirmatory information of value) is the first ascent of Mt. Austerity accomplished by the party on July 20. This mountain is situated five miles to the north-northwest of the camp and was triangulated at 10,987 feet, giving it a rank of some importance among the loftiest summits of the range.* It commands an unsurpassed outlook to the north and west across the Columbia valley. Wide snow fields, divided into three or more gathering basins by off-shoots of the range towards the river, send down dissipators in this direction. The cluster of summits to which Mt. Austerity belongs is composed entirely of primitive granite, while Mount Sir Sandford, a half dozen miles to the southeast and of greater elevation, is a solid mass of crystalline limestone. This curious juxtaposition of structural extremes presents a problem of considerable geological interest.

These excursions resulted in the determination of the main divide of the range for about eight miles. Numerous photographs had been secured from various points fixed by instrumental triangulation which would furnish a basis for a topographical map of the vicinity. Regaining the railroad at Donald by way of the government trail along the easterly bank of the Columbia, we at once set about preparations for another visit to this splendid alpine region.

* The average height of twenty-two peaks which have been triangulated at altitudes of 10,500 feet and over is 10,800 feet. The height mentioned for Mt. Austerity depends upon the value 11,634 accorded Mt. Sir Sandford by Wheeler's survey.

Our second expedition, setting out from Albert Canyon August 10, struck inland by way of the valley of the North Fork of the Illecillewaet River in order if possible to reach the peaks noted from Goldstream Mount from this side. Though Carson's reports previously referred to describe a road to the head of this valley, locally no reliable information could be obtained as to its condition or the character of the mountains thus accessible. Accordingly, as the bridges and trail might turn out to be impassable for horses, we employed our former porters and succeeded in reaching the pass at the head of the North Fork (Illecillewaet Pass) on the evening of the second day without encountering any obstacles more serious than those offered by our packs. Camp was established here for the ensuing week (August 12-19).

The North Fork valley presents some points of contrast to the ordinary valleys of the range, and for this reason a somewhat detailed reference to it may be warranted. Most commonly Selkirk valleys exhibit the sharpest possible contrasts between heights and depths. Their walls, frequently sheer cliffs, plunge down directly to the streams below. Profiles are sharp and bold with rounded forms in the minority. The valley in question, however, though gorge-like near its mouth, opens out after some miles rather widely. The mountains retreat on the east and stretch out to the north and south in a long ridge of alpine meadow-land seldom cut by passes below timber-line. This serves as a base from which the separate massifs rise, with wide gaps between, to perhaps 9,000 feet. There are only four or five of these mountains between Corbin Peak that overlooks the railroad at the southerly end and Mt. Sorcerer. They are all rather subdued in contour and bear comparatively little perpetual snow and ice on their westerly sides.

Of quite a different aspect is the range to the west. Though, from the valley, nearer spurs screen the higher summits for the most part, occasional fleeting vistas up tributary creeks disclose fine bold crags and lofty walls set among snow-fields and glaciers, some of which are about 10,000 feet high. About a dozen miles above the mouth these form quite an impressive display. At this point the valley bottom expands into meadows rankly overgrown with tall grass and weeds where the river relaxes somewhat from its usual headlong course.

These characteristics suggest to the wayfarer that possibly this valley formed a kind of eddy in some remote disturbance which increased the elevation of the range to the west without affecting its easterly wall to the same degree. Near the mouth of the valley at

Albert Canyon, Archean rock is disclosed.* For the upper five miles below Illecillewaet Pass, the valley wall on the west consists largely of dark gray limestone which crosses to the east in the vicinity of the pass and continues along this side to the north. From Mt. Sorcerer southerly the easterly wall appears to consist of a reddish brown quartzite. The river, in consequence of getting most of its supply from the west, has a dirty, black appearance in time of flood. From our camp on the pass many violent contortions in the strata and numerous faults were noted.

Illecillewaet Pass has an altitude of about 5,900 feet with scarcely a vestige of timber. The slopes thereabouts are grass covered and unusually bare of alders. To the west, a thousand feet above the pass, there is a small snow-field which sends down two tongues from the ends of which streams flow in opposite directions to Illecillewaet River and Downie Creek respectively. The latter valley continues the direction of the former to the north, and from Corbin Peak it should be possible to obtain an unobstructed view directly up this trough for thirty miles.

From our camp at Illecillewaet Pass we made the first ascent of Mt. Holway (Fig. 4) situated about five miles to the west of the pass, and affording by its elevation of something over 10,100 feet an unequaled outlook. We found with some satisfaction that this mountain belonged to the group of prominent peaks which we had noticed from Goldstream Mount, and in fact occupied an advantageous position in their midst. To the west we looked down into what is probably the chief source of Downie Creek. It is an exceedingly deep basin surrounded by precipitous walls, above which to the south lies a wide snow-field, culminating in a low dome some eight miles from our belvedere. The dome is cut off from the range forming the western wall of the basin by a narrow timber-line pass which is presumed to connect with Carnes Creek. Continuing northerly, the range attains an altitude almost equal to that of Mt. Holway in a lofty scallop-crested wall from which one large and numerous small glaciers stream valleywards in beautiful ice cascades. Glistening in the afternoon sunlight with fleecy clouds drifting lazily overhead, the range presented a serene alpine picture, and Serenity it has since been named. Mt. Serenity is suggested for the most prominent summit dominating the trunk glacier. Northwesterly were the depressions of the lower courses of Downie Creek and Gold Stream where the mountains did not in many cases surpass the snow-

* "A Note on the Geological Structure of the Selkirk Range" by Geo. M. Dawson, *Bull. Geol. Soc. of Amer.*, Vol. 2, p. 173.

line. Topographically the most striking feature in this vicinity is the Arrowhead group, mentioned above, which separates these streams. It was seen to be connected with the water-parting of the range by a winding, serrated wall some fourteen miles long, pierced in several places by high passes. At the point where the branch of Downie Creek descending from the pass makes its sharp turn to the west, this wall parts their streams by less than four miles. In this direction, between the branches of Downie Creek, the Illecillewaet Range

FIG. 4—Mt. Holway seen from the northeast across Downie Creek. The valley in the right foreground is that of a small left tributary of Downie Creek.

continued from our standpoint, rising in two instances to elevations of some prominence.

The familiar peaks near Mt. Sir Sandford described above were all in view. Swinging easterly and then southerly the panorama embraced the entire known range, all the mountains about Glacier as far south as Mt. Sugarloaf and the Battle Range being readily made out. In its remarkable scope of fully seventy-five miles along the

backbone of the Selkirks, the outlook from Mt. Holway can scarcely be equaled save perhaps by that from Mt. Sorcerer nearby. Southerly in the direction whence we had come, the Illecillewaet Range presented an interesting line of jagged summits (Fig. 5). For the highest, a forbidding snowless horn, about six miles distant, the name Mt. Moloch is suggested.

A second excursion from our headquarters to the top of Mt. Sorcerer (10,500 feet) (Fig. 6) east of the pass afforded valuable

FIG. 5—View southeast from the summit of Mt. Holway along the Illecillewaet Range. Mt. Moloch in the distance at the right, the valley of the North Fork of the Illecillewaet River at the left.

data on the immediate vicinity, but owing to clouds settling down about the summit just before we arrived it was impossible to make any distant observations. A long even ridge descending towards Mt. Iconoclast separates the basins of Gold River and Mountain Creek, both of which streams have their sources in the glaciers of the mountain. To the north, across the valley of Gold River, we had a good view of the pass leading into the southwesterly branch of Gold Stream. It is a snow-line pass, but without glaciers on either side,

and is probably passable for horses, though the lower approaches were not clearly seen.

After remaining nearly four hours on the summit, we were finally forced to descend amid thick snow flurries and snapping electrical discharges from the rocks. The mountain is the key to the drainage system of the Big Bend region, for within a radius of less than three miles is included the sources of its four longest rivers, Downie Creek, North Fork of the Illecillewaet, Mountain Creek and Gold River, and a short extension would take in that of the fifth, Gold Stream. Both Mt. Sorcerer and Mt. Holway furnish most valuable stations for the surveyor, the latter, perhaps, being the easier to occupy with an instrument.

A few days later a visit was made to the grassy saddle connecting the south branch of Gold River with Downie Creek. The aneroid gave its elevation as 6,800 feet, and except for the steep descent into the latter valley it should be practicable for horses. The bottom lands along Gold River appeared unusually open and grassy for a long distance.*

Having accomplished our principal objects by these excursions and the weather being unsettled, we returned to the railway in two days. On the way we halted at the mouth of a tributary valley leading to Mt. Moloch with the intention of exploring a splendid glacial amphitheater of which we caught glimpses through the trees in that direction, but sixteen hours of rain with a falling barometer forced us to abandon the project.

The accompanying map embodies the large topographical results of our trips. Its especial aim is to exhibit the relations between the trunk streams of the northern Selkirks with their chief connecting passes. It has not previously been possible for any one entering and following one of these valleys to know in what portion of the range he would eventually come out, but it is believed that this difficulty will no longer exist owing to the fact that our party was fortunately

* NOTE ON THE PASSES. It may be of value to list briefly the principal passes connecting these trunk valleys not already referred to.

Between Mountain Creek and what is probably the south branch of Six Mile Creek a high pass was seen south of Mt. Iconoclast. The approach is steep, though snowless on the side of the former.

Between Mountain Creek and the south branch of Gold River there are two passes, the more northerly being a broad open pass. Both are above snow-line and probably have glaciers on the north.

Between Downie Creek and Gold Stream there is a high pass at the westerly turn of the former. The Gold Stream side supports a small glacier.

Sir Sandford Pass (8,100 feet), west of Mt. Citadel at the head of Sir Sandford Glacier, leads down to Moberly Pass. It is practicable only for mountaineers, as seven miles of glacier must be traversed.

Silvertip Pass (8,400 feet) between the glacier of the same name and the valley of the north fork of Gold Stream is also a glacier pass suitable only for mountaineers, but it is the most direct line across the range in this region.

able to occupy summits along the axis of the range which covered the sources and upper courses of the master streams. Indeed, except for the territory northeasterly from Revelstoke and the very tip of the Big Bend itself, there is little of the region that has not been visible from our stations. The map consists of a reduction from the writer's work founded on an independently measured base fitted into the border of previously mapped country after alteration to a common scale, both being adjusted to a mean agreement on the various overlapping points. The only changes worthy of mention that

FIG. 6.—Mt. Sorcerer seen from the southwest across the valley of Downie Creek.

this process rendered necessary in the previous map occurred in the upper and middle courses of Gold Stream and Downie Creek. As these were apparently largely generalizations, the less hesitancy was felt in altering them to agree with the later observations.

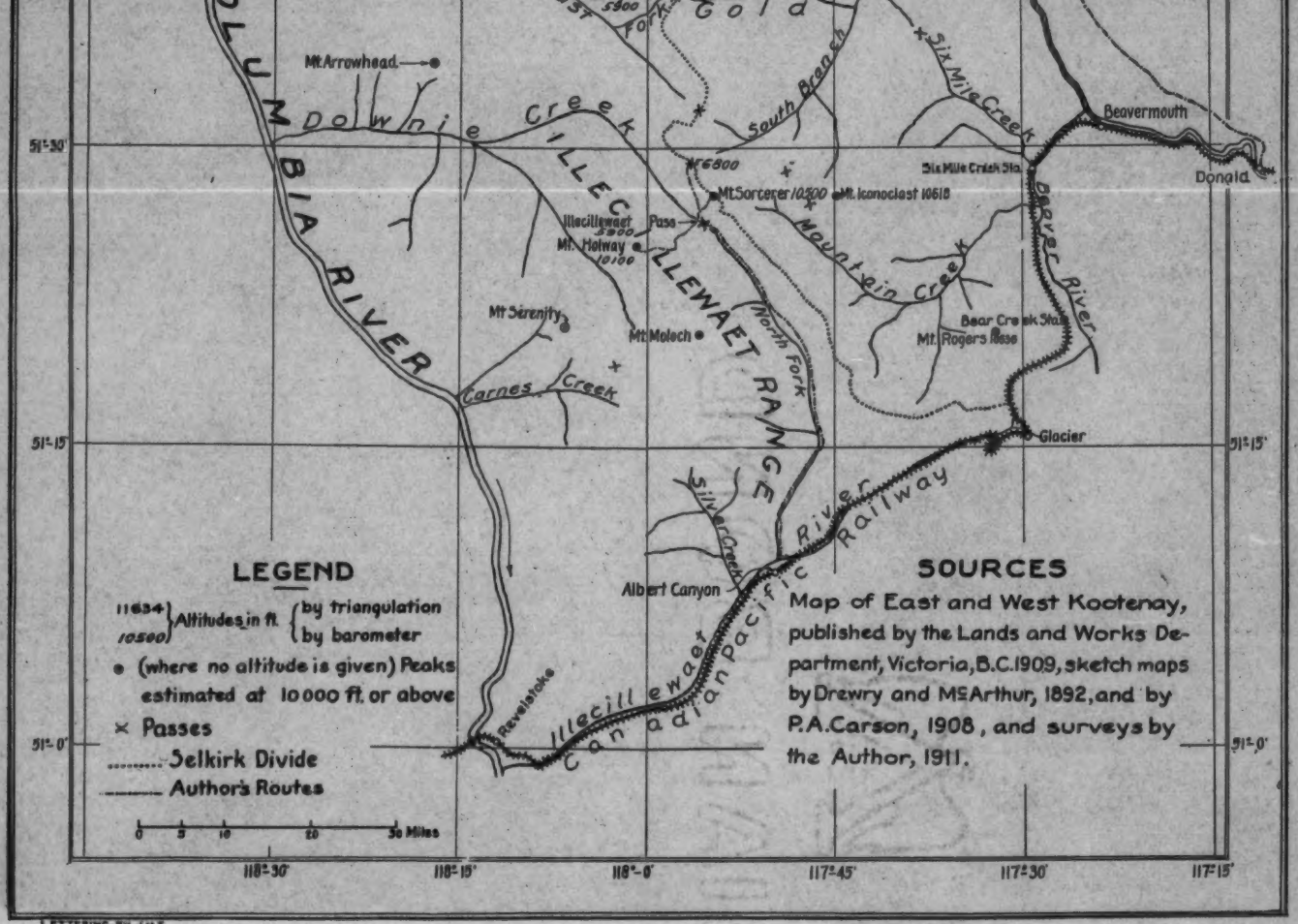
III. CONCLUSION

In conclusion, a brief summary of the physiographical characteristics of the Big Bend region may be appropriate. In area it covers about 2,400 square miles, which is entirely occupied by an exceed-

ingly complicated labyrinth of mountainous spurs and ridges that may be considered for present purposes as forming the northerly termination of the Selkirk Range. The greater number of these rise to between 7,500 to 9,000 feet in altitude, but there are many summits ranging between the latter limit and 11,634 feet, the highest measured point. That these figures indicate more than an insignificant relief is evident from the fact that the Columbia, in circling around the range, descends from about 2,400 feet at Beavermouth on the east to nearly 1,400 feet at Revelstoke on the west, so that almost always the visual angle cuts a vertical sweep of 5,000 feet, while one of 6,000 feet is not uncommon and even of 9,000 feet is not unknown.

With a snow-line that may be placed in the neighborhood of 7,500-8,000 feet, and a heavy precipitation, conditions are most favorable for glaciers, and these exist in the greatest profusion in all parts of the range. Examples of every recognized class are to be found with the exception of the continental, and even this is represented in miniature by single bodies of ice aggregating ten square miles in extent.

Below snow-line, the valley slopes are densely forested with spruce, fie, hemlock, yew, cedar, and pine, while in the bottom lands cottonwoods, birches, alders, and poplars are also to be found. These, intermingled with a varied undergrowth of tropical luxuriance and combined with canyons, precipices, falls, and rapids, form a nearly complete category of the obstacles with which prolific nature opposes the explorer. The final items (*caveat viator!*) are the mosquitoes, that flourish up to 6,000 feet, and the precarious weather, with regard to which it has been said with a near approach to truth that every sign means rain.



LEGEND

11634 / 10500 } Altitudes in ft. { by triangulation / by barometer

• (where no altitude is given) Peaks estimated at 10 000 ft. or above

× Passes

..... Selkirk Divide

——— Author's Routes

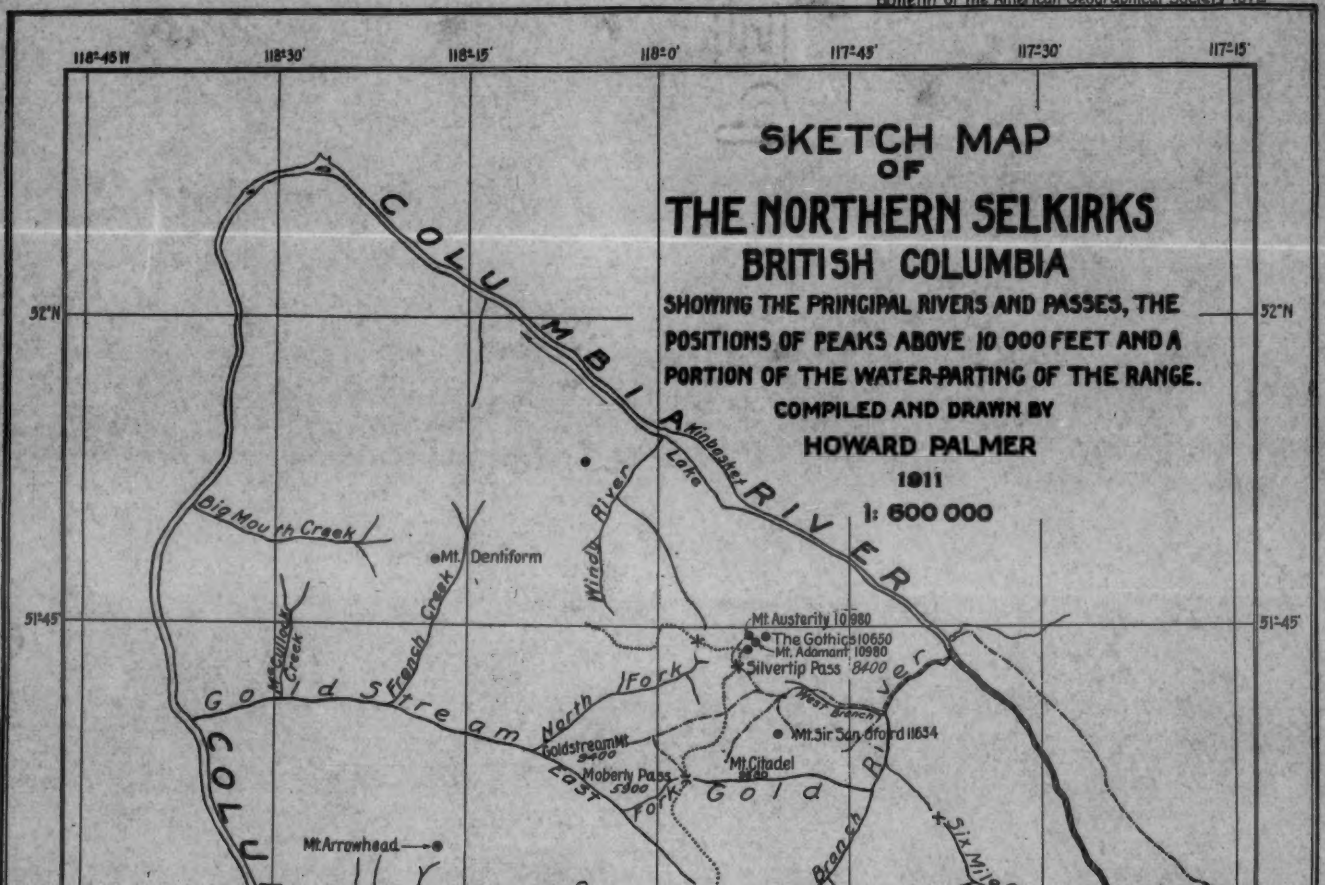
SOURCES

Map of East and West Kootenay, published by the Lands and Works Department, Victoria, B.C. 1909, sketch maps by Drewry and McArthur, 1892, and by P.A. Carson, 1908, and surveys by the Author, 1911.

LETTERING BY J.H.F.

N. B.—The values on the linear scale should read 0, 2½, 5, 10, 15 miles.

Bulletin of the American Geographical Society 1912



PRESENT ACTIVITIES OF THE COAST AND GEODETIC SURVEY*

BY

O. H. TITTMANN

Superintendent of the United States Coast and Geodetic Survey

There are various reasons why the head of the Coast and Geodetic Survey should be particularly glad to speak to an association of his colleagues in the engineering profession in Philadelphia. Philadelphia stands in a certain maternal relationship to the Coast Survey for, when the question of organizing a survey was up, the government turned to members of the American Philosophical Society for counsel and guidance. In response to the circular of the Secretary of the Treasury, calling for plans for the conduct of a survey, thirteen plans were submitted. These were fortunately referred to the then Vice-president of the American Philosophical Society, as Chairman of the Committee, to decide on the adoption of the best plan. The Committee endorsed the scientific methods proposed by Mr. Hassler who became the first Superintendent of the Survey.

It was a good example to set, but one which the government has not always pursued, to have the fundamental principles on which a work of applied science should be done, submitted to scientific men for consideration. To engineers it may seem as though no other way could have been chosen, than the one that prescribed a trigonometric survey as the basis of an extended survey, but as a matter of fact other methods were proposed. These things occurred in 1807, from which date it is seen that this Bureau is old in years, but facts will show that it is young in spirit, and strives to march in the van of progress, to lead where it can, and to follow only where it must. When the plans for a survey were made the Coast of the United States extended from Maine to Florida. The Floridas, much of the Gulf Coast, the Pacific Coast and Alaska were geographical conceptions outside of what is now the United States. At the present time the work of the Survey has been extended to the Philippines, the Hawaiian Islands, and other islands under the jurisdiction of the United States.

* Republished from the *Proceedings* of The Engineers' Club of Philadelphia, Vol. 29, No. 1, 1912, by permission of the Publication Committee. The *Bulletin* is indebted to Superintendent Tittmann for the illustration in this paper.

In brief language the following extract, from an official publication, describes the duties of the Survey:

"The Coast and Geodetic Survey is charged with the survey of the coasts of the United States, and coasts under the jurisdiction thereof, and the publication of charts covering said coasts. This includes base measure, triangulation, topography, and hydrography along said coasts; the survey of rivers to the head of tide-water or ship navigation; deep-sea soundings, temperature, and current observations along said coasts and throughout the Gulf and Japan streams; magnetic observations and researches, and the publication of maps, showing the variations of terrestrial magnetism; gravity research; determination of heights; the determination of geographic positions by astronomic observations for latitude, longitude, and azimuth, and by triangulation, to furnish reference points for State surveys.

"The results obtained are published in annual reports, and in special publications; charts upon various scales, including sailing charts, general charts of the coast, and harbor charts; tide tables issued annually, in advance; Coast Pilots, with sailing directions covering the navigable waters; Notices to Mariners, issued monthly and containing current information necessary for safe navigation; catalogues of charts and publications, and such other special publications as may be required to carry out the organic law governing the Survey."

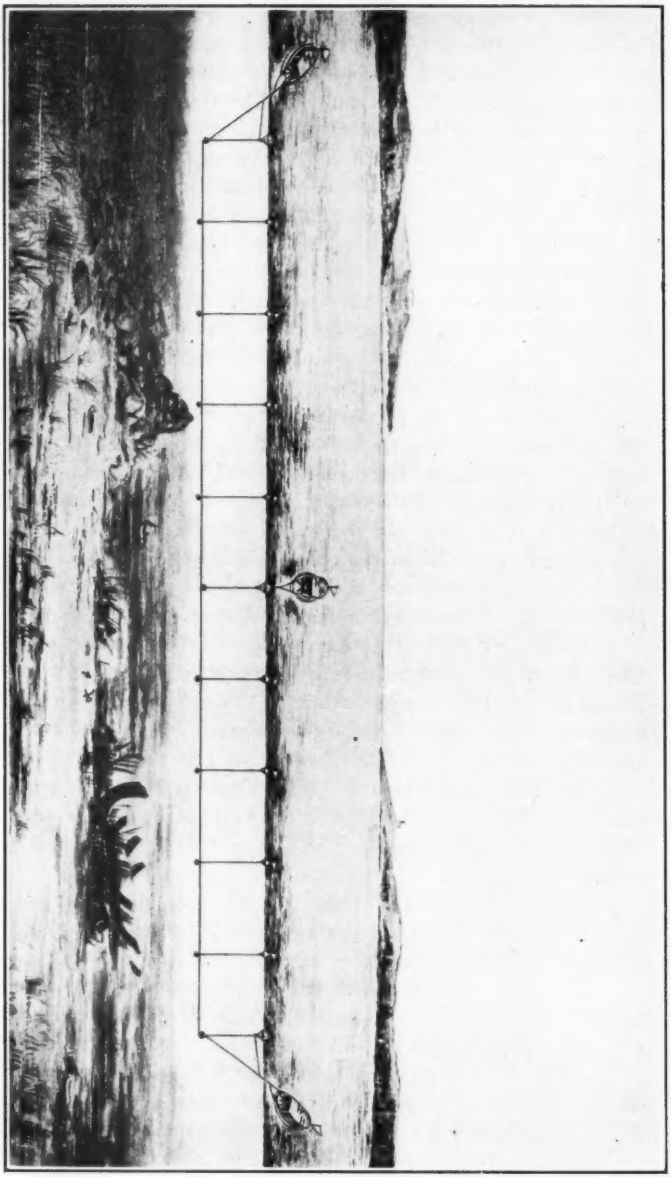
It is because of the vastness of the subject that this paper is intended to touch upon present progress, conditions, and problems only and much that would be of interest and importance must be omitted.

The principal business of the Survey is making charts of the coasts. If there were no changes in the depth of channels, if the artificial aids to navigation remained fixed and unchanged, if the aspect of the shores from the navigator's viewpoint remained the same, if the draft of vessels remained the same, if the variation of the compass remained the same, if, in short, things were not as they are on this changing globe, or the world were commercially fossilized, a survey once made would last forever. The actual facts are different.

Time was when it was a matter of small concern what dangers to navigation might lurk at a depth of more than 20 feet, but with the increased size and draft of vessels and their enormous cost, a revision and reëxamination of much of the old hydrography by new methods has become necessary. The channel sweep and wire drag now supplement the lead. After these new appliances have swept the bottom the Survey may look with equanimity on the evolutions of ten-million dollar battleships in our waters.

With every new chart that is published the Office assumes the responsibility of keeping it correct, showing the changes in the magnetic variation, in the depths, and in the landmarks. This necessity,

For locating sunken rocks and like dangers to navigation which the usual methods of sounding fail to discover. The long wire, suspended at any desired depth from specially designed buoys, is dragged through the water by two or more launches. The length varies from 100 to 14,000 feet.



COAST AND GEODETIC SURVEY, WIRE DRAG.

For locating sunken rocks and like dangers to navigation which the usual methods of sounding fail to discover. The long wire, suspended at any desired depth from specially designed buoys, is dragged through the water by two or more launches. The length varies from 100 to 12,000 feet.

affecting the great number of charts that are published, engrosses the energy of the small force at the disposal of the Survey to so great an extent that it has become necessary to simplify the charts in many particulars. Not only do the results of these extended activities flow into the Office, but through the coöperation of the Corps of Engineers of the Army, its surveys for improvements are at once furnished to the Office. A hearty coöperation now exists between most Bureaus of the National Government.

When the publication of charts was first commenced they were engraved on copper in minute detail and with all the skill and beauty which the engraver's art could command. This system was followed until the problem of keeping the charts correct became one of overshadowing importance, on account of the detail shown on them not absolutely necessary for the navigator.

The first survey of the coasts having been completed it appeared possible also to reduce the number of charts by a rearrangement. Careful consideration of the economics of the problem showed that by such a rearrangement of limits, and by simplification, it would be possible to meet the ever increasing demands made on the Survey. These changes involve at the outset much work, but by following a consistent policy they can be brought about gradually without too great a strain on the resources of the Survey.

The tidal and current data hold a prominent place on the charts. In regard to the former, the charts give ample information, and this is supplemented by the publication of tide tables covering the world and which for completeness, are unequalled by any publication devoted to this purpose. The Survey has recently completed a tide predicting machine of great scope and power. The theory of tides has been illuminated and advanced by researches made in the Bureau so that in this particular the Survey holds its place in the front rank.

In regard to currents, it must be said that much remains to be done, but this work has been delayed and crowded aside by the more pressing needs of commerce in other directions.

Just as the tide tables supplement the charts so do the sailing directions, designated as Coast Pilots, and to the preparation of which the labors of a number of experts are devoted.

Magnetics. It is a part of the regular duty of the Survey to show on the charts the magnetic declination and its annual variation. Unfortunately, the laws governing this phenomenon are unknown. Of late years Mother Earth has made a sudden acceleration of the rate of variation. Thus, along the coast of Maine, the change has

been from 3 to 6 minutes per annum and, on the far western coast, from 2 to 5, while the line of no variation persists fairly well in staying in one place. It is, therefore, part of the Survey's duty to record these eccentricities of the needle. As an important auxiliary to their detection, the Survey maintains a magnetic observatory in Vieques, an island lying to the east from Porto Rico; another in Maryland, a third in Arizona; one in Sitka, and one in the Hawaiian Islands. In all of these, observations are made by continuous photographic registration. All the world is busy with similar observations, and whenever a scientifically equipped expedition, as for example the recent ones to the Antarctic, starts out, there is a general coöperation between the different governments of the world for the purpose of making simultaneous observations. It is to be hoped that sooner or later the mystery will be fathomed so that predictions of what is going to happen can be made.

The Triangulation and the Figure of the Earth. In so extensive an undertaking as a trigonometric survey of the coasts and interior of our country it inevitably happened that surveys were made in detached localities, in Maine, in Florida, on the Gulf, and on the Pacific coast. Each area was referred to some local datum just as detached leveling would be. Gradually, these separate surveys were connected and it became necessary to adopt an origin of coördinates in reference to which all geographic positions should be expressed.

Every extended triangulation, whose determined positions and relative bearings are to be given, is developed on some adopted spheroid of reference. In the beginning Bessel's spheroid was used by the Survey. Later, the geographical positions were computed on Clarke's spheroid. An enormous amount of computation is involved in shifting from one to another and yet it is desirable to utilize all increase in knowledge of the size and figure of the earth.

In order to meet the difficulties presented by these conditions it was decided to separate the refined investigation of the figure and size of the earth from the practical requirements of using a spheroid, which should be sufficiently close for the practical requirements of the surveyor, the engineer, and the geographer. It is believed that the Clarke spheroid, of 1866, which was adopted by the Coast and Geodetic Survey, satisfies these latter requirements for the whole American Continent. The Survey next selected a particular point in the triangulation and a direction, and now, when triangulation is spoken of as being on United States Standard Datum, the meaning is that the triangulation has been referred to Clarke's spheroid on which this particular point has a definite position.

Not only the Coast and Geodetic Survey triangulation, but that of the Lake Survey also, has been referred to this datum and wherever the topographic work of the Geological Survey has been connected with the triangulation of the Coast and Geodetic Survey it is equally referable to this datum. In this way has been achieved a homogeneous system of geographical coördinates for the vast domain of the United States, and it is not unlikely that Canada and Mexico will continue the same system.

It is not necessary to point out the practical value of a trigonometric survey. New uses for it continually arise. Witness the cadastral survey of Greater New York which is based on U. S. triangulation. The Oyster Surveys of the various States utilize the trigonometric points for the delimitation of the oyster-beds. The Coast Artillery is supplied with data which are used for fire control, and, in general, the network of triangulation forms a basis for coordinating all topographic and economic surveys, and thus the work accomplished is forever increasing in value and usefulness.

Among the unforeseen applications was the demonstration of the precise amount of the displacement of the earth's surface, by the San Francisco Earthquake along the fault line, and the extent of the movement at right angles to it.

Until about six years ago the method of deriving the figure and size of the earth from triangulation was to deduce it from measured arcs of parallels and meridians. That is, after the length of a meridional arc or parallel had been measured, the angle which its termini subtended was astronomically determined. But owing to the irregular distribution of masses on and within the earth's crust the actual direction of the Zenith differed from the geometrical Zenith of the spheroid of reference. This well-known error, called the deflection of the plumb line, was assumed to average out in a large number of arc measurements. At any rate no correction for it was applied.

A great many years ago, Archdeacon Pratt, while studying the pendulum observations made in India, reached the conclusion that wherever there were visible mountain masses such as the Himalayas there was a corresponding defect of mass in the earth beneath, but it was reserved for the Coast and Geodetic Survey to extend and apply this theory in the computation of the size of the earth from arc measurements by introducing into Geodesy what is now known as the principle of Isostasy. This principle is that the matter composing the earth's crust to a certain depth has a tendency to adjust itself to a condition of hydrostatic equilibrium or has done so. Stated in another way, upwards from a certain depth below sea-level, each

unit area has the same amount of mass above it whether we measure to the summit of mountains or merely to sea-level.

By trial computations, the most probable depth to which this compensation extends, was found to be about 122 kilometers, or seventy-five miles. Note how the work of the geodesist trenches on the domain of the geologist and geophysicist.

The hypothesis of isotatic compensation having been introduced, the effect of the visible topography for a distance of about 2500 miles was computed for each of the primary triangulation stations of the Survey, and the deflection of the zenith, previously referred to, was corrected at each station. Then the spheroid, whose surface most nearly agreed with the surface of the United States, was deduced and this gave the corrections to Clarke's spheroid. It is safe to say that the values for the compression and semi-diameters of the earth, resulting from these computations, are the most accurate known. It may be added that, when the results of this work were presented two years ago to the International Geodetic Association in London, the Americans were congratulated on having made a new epoch in Geodesy.

The Pendulum. While one must rely on trigonometric observations to determine the size of the earth its figure can be determined by gravity observations, that is, by the pendulum alone. It is, therefore, a very important auxiliary in a Geodetic Survey. For the purpose of comparison the observations made with the pendulum must be reduced to sea-level. The manner of reducing them is one of the moot questions in Geodesy. Now, the recognition of the existence of isotatic compensation, which has been proved by purely astronomic methods, compels one to take it into account in the pendulum reductions. The method of reduction just introduced in the Survey not only does that, but, also, for each station, takes into account the effect of the attraction of visible masses for the whole earth. This is a great stride in advance; but the inevitable logic of this process has not been received abroad with open-minded enthusiasm. The correctness of the method has been proved for gravity work in the United States, and it is for others to show that it does not apply to the rest of the world.

The International Geodetic Association. To make a new epoch in science is no mean achievement; but mention has already been made of the compliment paid to the Americans at the last meeting of the association in London. This association exists by virtue of a formal convention between the great powers of the world. It is an official organization whose object is to promote knowledge of the

size and figure of the earth. Canada, the United States, Mexico, and Argentina belong to it. So do Japan and, practically, all the powers of Europe. It is one of the oldest of international scientific associations. The delegates to the meetings report progress, and compare methods and results, and endeavor to strengthen such undertakings as the Cape to Cairo Arc of the Meridian and the junction of the Great Trigonometric Survey of India with the Russian Survey. To carry out this last piece of work the association covets the coöperation of China and hopes that that ancient empire will ultimately join the other powers in the undertaking.

Among the tasks undertaken by the association is the determination of the variation of latitude. For this purpose, it maintains six small observatories in the northern hemisphere, two of which are in this country and are under the direction of the Superintendent of the Coast and Geodetic Survey.

Two years ago the astronomer in charge of the Observatory at Gaithersburg, Md., proposed the construction of a Zenith tube for photographically determining the variation of latitude and, at the author's request, the association gave about $2500 for the purpose. The instrument was constructed in this country, has been mounted, and the preliminary results indicate that a step in advance has been taken by securing a higher degree of accuracy, than was before attainable, with a considerable simplification of methods.

The association meets once in three years and the principal countries in Europe have vied with each other in extending invitations for meeting in their capitals. Although the Coast and Geodetic Survey has taken an honorable part in these meetings it has never had the privilege of extending the hospitality of this country to the association. Mention of this fact is made with the same embarrassment that the author feels in representing a great nation at such meetings, and having to maintain silence when the different nations of Europe are competing for the place of meeting.

The Geodetic Level. The levelling instrument, developed in the Coast Survey, with which nearly all engineers are familiar, may be called a binocular level because there is a telescope attachment by means of which the level is read by the observer without shifting his position. The level bubble itself is set into the telescope tube so as to be near the line of sight. Furthermore, the telescope tube is made of the alloy of nickel and steel called "invar" which has a coefficient of expansion of only about one-tenth that of steel.

The introduction of this level has added greatly to the accuracy of the operations, the speed with which the best grade of work can

be done has been much increased, and the cost correspondingly reduced.

In a slightly modified form it is in use in the Geological Survey. The Egyptian, Australian, and Canadian governments have also introduced it, and a recent report of the Director of the Great Trigonometric Survey of India shows that a Commission was appointed to report on its merits, and that as a result of the report all their parties will soon be equipped with it.

The Coast Survey is not the only government agency engaged in leveling. The Survey confines itself to running standard lines which it connects with mean sea-level, at various points along the coasts, the datum planes being derived from long series of tidal observations. The coöperation between various agencies of the government is shown by the fact that all the principal lines of level, those by the Geological Survey, by the Deep Waterways Commission, the Mississippi and Missouri River Commissions, and by the Lake Survey, are utilized by the Coast and Geodetic Survey in a general adjustment which will serve for all time as the basis of heights in this country. The value of this work will continue to increase from generation to generation. The elevations of the bench marks in the precise level net east of the Mississippi River will be held as published, while the next adjustment will fix the final elevations of the bench marks in the net of precise leveling to the westward of that river.

One phase of leveling, which is of scientific interest, was connecting the mean tide level at San Diego with mean tide level at Seattle, where a difference of over three feet was found. Had the levels been run along the sea-shore from San Diego to Seattle, no difference would have developed, assuming the work to have been accurately done. But as the lines were run up to and over high plateaus in the interior, and down again, it was found that the orthometric correction had to be applied, and this brought the operations into perfect accord. That is, the apparent difference of level was due to the route followed. This results from the consideration that two water-level surfaces, one above the other, will not be parallel as one travels north or south. In running east and west it makes no difference, but in running north and south this becomes a measurable quantity.

Our Northern Boundaries. The Superintendent of the Coast and Geodetic Survey is Commissioner for the demarcation of the Alaskan boundary, and for that portion of the northern boundary of the United States extending from the Pacific Ocean to the Bay of Fundy, with the exception of the boundary running through the Great Lakes. The beginning of the settlement of the boundary,

through Passamaquoddy Bay, goes back to the Treaty of Peace of 1782; the settlement of disputed questions was again provided for, in the Treaty of Ghent, in 1814, but certain portions of the line were not settled until last year. Some portions of the line have never been laid down on any map but, generally speaking, the duty of the present commission is merely to fix up upon the ground, by surveys and monuments, the line where it has not been heretofore fixed with that particularity with which boundaries should be marked. The distance from the Pacific Ocean to Passamaquoddy Bay, along the boundary, is about 3800 miles, 1200 miles of which are water boundary, running through the Great Lakes. When the boundary to the west of the Lake of the Woods was marked it was supposed that no one would ever feel any particular interest in this unsettled region, and that provisional marks or monuments at long intervals would suffice for all time. Needless to say, the settlement of this country brought with it irritating questions as to the precise location of the boundary line. For the settlement of these questions a joint treaty covering the boundary from end to end was exchanged and ratified, in 1906, although prior to that time an international commission had been at work in a less formal way in restoring old monuments and tracing the boundary where international questions had made it necessary. The triangulation has been extended from the Pacific Ocean to the summit of the Rocky Mountains, and this part of the line has been monumented with aluminum bronze monuments.

To the east of the Rocky Mountains this same thing has been done, at the present time, to within 100 miles of the Lake of the Woods, and the whole boundary has been carefully mapped, for a short distance, on each side of the line. Progress has also been made in surveying the thickly wooded region extending from Lake Superior to the Lake of the Woods, and further to the east the monumenting and surveying is in progress along the northern boundary of Maine.

All this work is done by international coöperation, under two commissioners, one representing Great Britain and the other the United States.

Probably more has been said of the demarcation of the Alaskan boundary than of this northern boundary. The Alaskan boundary work has been going on simultaneously ever since the tribunal, in London, in 1903, settled the vexed question of the location of the southeastern boundary of Alaska. The greater portion of this line runs from mountain peak to mountain peak over inaccessible fields of snow and ice. Starting on the 141st meridian, a little to the west

of Mount St. Elias, the line follows these Alpine summits to the head of Portland Canal, and down that canal to the vicinity of the historic parallel "Fifty-four, forty, or fight," and thence to the Pacific. Wherever it was possible to place monuments it was done, especially at all river crossings in the passes; all of the mountain peaks were trigonometrically located and the region was mapped photo-topographically. From photographs taken at determined trigonometric points maps were made by geometric construction. It is hardly necessary to say that the reports of the surveyors, who conducted this difficult and hazardous enterprise, are full of thrilling adventure, but only two lives have so far been sacrificed. Many of the men had the unpleasant experience of dropping into glacial chasms, from which they were rescued, but the two men who lost their lives fell into an abyss and their bodies were never recovered. The field work of the southeastern Alaskan boundary has been nearly completed. The other part of the Alaskan boundary extends from the vicinity of Mount St. Elias, northward along the 141st meridian to the Arctic Ocean, a distance of about 600 miles. There never has been any international dispute as to that part of the boundary, which was defined by the treaty of 1826 between Great Britain and Russia. But for reasons not necessary to give here a new treaty was made in 1906 by which the Commissioners were instructed to determine, by means of the telegraph, a point on the 141st meridian and to trace a north and south line through it, extending from the Arctic Ocean to the southernmost point of this boundary. The physical difficulties of this work are very great owing to the difficulties of transportation and the shortness of the season. The difficulties of transportation are illustrated by the experience of two years ago, when the parties had to march 300 miles to get to the working ground. The plan of the work which is being carried out contemplates a north and south transit line along this meridian, cutting a line through the timber, planting aluminum bronze monuments in rock or cement bases at intervisible intervals, carrying on a triangulation which spans the boundary and the topographic mapping of a strip about two miles wide on each side of it. Aside from the immediate purpose of the delimitation, this work will serve as an admirable basis for coördinating the land and economic surveys which will follow in another generation or two.

The southern limit of the work accomplished along the 141st meridian is at Mt. Natazhat. It is only a provisional limit for it will be necessary to go about 90 miles farther south, through the mountainous ice field which lies to the north of Mount St. Elias.

Just what can be accomplished there remains to be seen, for it is plainly useless to plant monuments on moving glaciers.

Toward the north, in the land of the Midnight Sun, the transit line has crossed a range of mountains whose crests are estimated to be about 7,000 feet high, distant about twenty miles from the coast. The last station is about seven miles from the Arctic Ocean. The topography, triangulation, and monumenting have not been finished quite so far, and the details of this work are not yet at hand, as the parties are only just returning after a very successful season. The season was marred only by an outbreak of smallpox among the Indians which, as a matter of self-protection as well as for humanitarian reasons, engrossed the care and attention of the American Chief Engineer and his surgeon all summer.

The Survey is giving special attention to the publications, for the use of engineers, of the geographic coördinates, the descriptions of the trigonometric stations, and the leveling and magnetic results. The daily mail at the Survey office impresses one with the widespread and increasing demand for this information, and taxes the ability of the office to keep pace with it. Each division is in charge of an expert and the result is that the methods of the Survey compel the close attention and study of other nations and often serve as a model for them.

INVESTIGATION OF ILLINOIS SOILS

BY

CYRIL G. HOPKINS

The Agricultural Experiment Station of the University of Illinois has been engaged in the investigation of Illinois soils for about ten years. These investigations are conducted by soil surveys, by analyses of representative samples of the various types of soil found in the State, and by culture experiments which are carried on to some extent by pot cultures in glass houses, in large jars filled with different types of soil treated and cropped in different ways, and much more extensively by field experiments which are in progress on thirty-five different soil experiment fields, aggregating about 800 acres of land on representative soils in various parts of the State.

A general soil survey of the entire State was first made in which fourteen great soil areas were located, based upon soil formations,

and one or more of the most important soil types found in these areas were investigated by ascertaining the stock of fertility contained in the soil and the results in culture experiments where deficient fertilizing materials were applied to the land. In this way much information was secured relating to twenty-five of the most important and most extensive types of soil in Illinois. This general soil survey has been followed by a detailed soil survey in which every type of soil on every man's farm is found and the boundary lines located on an accurate map.

This detailed soil survey is conducted by the State of Illinois without coöperation with the United States Department of Agriculture, and it has already covered thirty-seven counties, or more than one-third of the entire State. The publication of the detailed soil maps has been intentionally delayed in order that the chemical analysis, showing the total stock of fertility in each type of soil, might be completed, and more particularly in order that several years' results from actual field investigations might be included in the report in order to give it value and to carry conviction to the farmers and landowners concerning the importance and possibility of different methods of soil improvement.

The publication of these reports is now in progress. Report No. 1, "Clay County Soils," and Report No. 2, "Moultrie County Soils," have already been published and distributed. Clay County is one of the representative counties of a great area in Southern Illinois, known as the wheat and fruit belt, while Moultrie is a typical corn-belt county of the central part of the State.

An attempt was made ten years ago to coöperate with the United States Bureau of Soils in the detailed soil survey of Illinois, but the methods of surveying followed by the Bureau were so general and superficial in character that the work proved altogether unsatisfactory both to the Illinois Experiment Station and to the practical and progressive farmers of the State. A report of this coöperative report of Clay County, Illinois, was published in connection with the "Field Operation of the Bureau of Soils, 1902," reference to which shows that all of the upland soils of the county, aggregating about 85 per cent. of the total area, are classified as one type of soil, while Soil Report No. 1, "Clay County Soils," published by the University of Illinois Agricultural Experiment Station, March, 1911, shows eleven different types of upland soil. In a word, the report issued by the United States Bureau of Soils tells what crops are commonly grown in the county and gives soil analyses showing only the percentages of sand, silt, and clay, with no information concerning the stock of

fertility; while the report published by the University of Illinois gives the total stock of every important element of fertility in every type of soil and also gives the results obtained from the addition of different kinds of fertility in different forms, especially in the most economical and profitable forms for use in permanent systems of soil improvement, including farm manures and the use of leguminous crops (which constitute the farmers' natural means of securing nitrogen from the inexhaustible supply in the air), ground natural limestone (which is not caustic in its action, does no damage to the soil, and which is the most economical form of lime to use in normal conditions), and either steamed bone meal (originally a farm product) or fine-ground natural rock phosphate, a still more economical form of phosphorus, which can be secured at sufficiently low prices from the nearby deposits in Tennessee to enable Illinois farmers and landowners positively to enrich their soils in that very important element. Magnesium is also supplied in natural dolomitic limestone, and potassium is liberated from the soil where the natural supply is essentially inexhaustible; or on certain abnormal soils, such as peaty swamp land, soluble potassium salts are used with large profit.

Several additional county soil reports are now in process of preparation, printing or lithographing, and hereafter the publication of the reports is expected to keep pace with the soil survey, which it is hoped will cover the remainder of the State within the next ten or twelve years.

SCOTT'S SECOND ANTARCTIC EXPEDITION*

BY

EDWIN SWIFT BALCH

On March 31, 1912, the *Terra Nova* returned to Akaroa, New Zealand, from her relief voyage to Captain Robert Falcon Scott's expedition in East Antarctica. The *Terra Nova* thus has come out of the Antarctic ice later than any ship heretofore, so late in fact that some students of Antarctic conditions had given up expecting her home this year. She brings back important news of Scott's work, and although the results can hardly be analyzed as yet ex-

The *Bulletin* has not printed an Antarctic chart with Mr. Balch's papers on the Amundsen and Scott Expeditions because it will not be possible to indicate their routes and the position of their discoveries till their maps are published. It is suggested that readers of these papers consult, for purposes of orientation, Antarctic charts such as are found in the last edition of the Century Atlas (Sheet 3½) or the charts in the Stieler, the Andree, and the E. Debes Atlases.

cept in a preliminary way, a brief summary of the work may be attempted.

Scott sailed in the fall of 1910 in the *Terra Nova,* and after a voyage through Ross Sea, where he met Amundsen at the Bay of Whales, he landed with a strong party at McMurdo Sound. Here a basal winter camp was established, nearly in the same locality where he himself and also Shackleton had wintered before.

As soon as Scott was installed ashore, he proceeded south, starting on February 8, 1911, on a depot laying trip. This proved to be hard work. The snow surface of the Barrier was soft in places, and there were some heavy blizzards. In one of the blizzards two of the ponies succumbed. On February 16, in 79° 30′ S., Scott laid down over one ton of stores in a cache, which was called One Ton Camp. On their return, one of the dog teams went through a bridge on a crevasse, falling sixty feet. By sheer luck, none of the men went down, and only one of the dogs was killed.

On February 24, 1911, Scott and some others started again to lay down more stores. They encountered another tremendous blizzard, from which the ponies suffered severely. On their return some of the party were forced, on account of the tired condition of the ponies, to camp on some sea ice not far from the winter quarters. During the night the ice broke up and began to move. With infinite difficulty the sledges were dragged over the pack, the ponies jumping from floe to floe. Finally the party neared the Barrier, and Crean was able to climb up and go for assistance. With Alpine ropes the men and the sledges and their loads were pulled up on to the Barrier, but nothing could be done for the ponies, and three of the best were lost. From this occurrence as well as from the one mentioned before it may be inferred that ponies are not entirely suitable for Antarctic work. Another cause militating against their use is the fact that, when killed, they cannot be eaten by the other ponies, thus entailing a loss to the commissariat department of the gravest nature under Antarctic conditions.

Between January 27 and March 15, 1911, another party made a long scientific excursion to the westward. This party, consisting of Debenham, Wright, Evans, Griffiths and Taylor, is spoken of as the Western party. After laying down a depot at Cathedral Rocks near the Farrar Glacier, they sledged all about this neighborhood and then returned back by way of the Koettlitz Glacier, of which also they made a careful study. This party made some of the most important scientific observations obtained by the expedition, and these will be spoken of further in this article.

The winter was spent much in the usual way. The hut proved comfortable, and its arrangements for lighting, heating, ventilation, and cooking were eminently satisfactory. The stable for the ponies and the shelter for the dogs also worked well. Every one was fully occupied with scientific and station work, exercising animals, etc. A series of lectures was organized and football was played to within a month of midwinter. The average temperature at the station was below —40° F., at the lowest —50° F. The wind averaged 15 miles an hour, but sometimes blew hard with the temperature at —30° F.

During the winter a journey was made by Wilson, Bowers, Cherry and Garrard, to Cape Crozier to observe the incubation of the emperor penguins at their rookery. They started on June 27 and were absent five weeks. This first winter Antarctic journey taxed the men's powers of endurance to the utmost. On the Barrier the temperatures were seldom above —70° F., the lowest observed with a sling thermometer being —77° F. The storms were terrific. On one occasion a tent and other carefully secured articles were blown away, and, after straining for fourteen hours, the roof of the shelter hut flew to ribbons. In spite of the dangers, darkness, and cold, however, the party were able to reach the rookery, and to secure some eggs at different stages of development, which should give considerable information regarding the embryology of the emperors.

The so-called Northern party, consisting of Campbell, Levicky, Priestly, Abbott, Browning and Dickerson, was picked up on January 4, 1912, at Cape Adare by the *Terra Nova* on her voyage south. They were landed on January 8, at Terra Nova Bay. Hence they proposed to work due north between Mount Melbourne and the Nansen range proceeding as far as time allowed with the object of examining the extreme northeastern land plateau, both geographically and geologically. The *Terra Nova* on its northward voyage tried to take this party on board again but was not able to do so. They were provisioned and equipped, however, in view of this possible emergency arising, and are to proceed south, a distance of about 200 miles, to the winter quarters at McMurdo Sound.

Scott himself started south on November 2 or 12, 1912, bound for the South Pole. He passed the abandoned motors of the advance party which he caught up at 80° 30′ S. Evidently motor sledges have not developed as yet sufficiently to meet quite successfully the conditions of Antarctic travel. Although they dragged heavy loads over the Barrier and crossed crevasses in safety, yet

the motors, although cooled by Antarctic zephirs, got overheated, and time and conditions did not permit of the defects being taken in hand.

After the return of the motor party, Scott pushed on steadily south over the Barrier, killing his ponies one after the other for food for the dogs. The weather was bad, snowstorms frequent, the sky continually overcast, and land rarely visible. On December 10, 1911, they were in 83° 15′ S., near Mount Hope, at the foot of the Beardmore Glacier. Traveling up this was terribly hard work. The lower reaches were filled with soft snow, into which men on foot sank in to the knee at each step. It was necessary to do all the pulling on skis. The runner surface of the sledges proved inadequate, and these frequently sank in to the cross-bars, requiring to be extricated with standing pulls. Working from ten to eleven hours, they could only advance about five miles a day. Higher up, the going became better, and the party made better time.

On December 21, they were in 85° 7′ S., 163° 4′ E., at a height of about 6,800 feet. On Christmas day they were close to 86° S., at a considerably higher altitude. On New Year's Eve, in 86° 56′ S., they made another cache, and the seamen of the party rebuilt the sledges with new short runners under the most adverse conditions. On January 4, 1912, the last return party under command of Lieutenant Evans, bade Scott farewell in 87° 35′ S., at an altitude of 9,800 feet, and left him struggling forward to the South Pole. With Scott were Dr. Wilson, Captain Oates, Lieutenant Bowers, and Petty Officer Evans. They had a month's provisions and were excellently equipped. They have doubtless, let us hope, after attaining the South Pole for the second time, long since returned to their winter quarters.

On the return journey of the last supporting party, which reached 87° 35′ S., Lieutenant Evans, commanding the party, developed a bad case, the only one on the expedition, of the much dreaded disease scurvy. Owing to the party being short handed, Evans was compelled to continue pulling the sledge. His condition became more serious daily, until finally he was unable to stand. His companions thereupon dragged him to within thirty miles from winter quarters, to which Crean then made a forced march alone, and brought back Dr. Atkinson. Evans' life was thus saved, but he had to be invalided back to New Zealand where he is now convalescent. It seems strange that with all modern medical knowledge there should still be danger of scurvy in the Polar regions. It is said to be a form of ptomaine poisoning, and doubtless comes from the

canned food which unfortunately must, to some extent, still be resorted to.

Much scientific work and many observations were carried out by the various members of the expedition. Self-registering meteorological instruments have given a continuous record of the pressure of temperature within the neighborhood of McMurdo Sound. The upper atmosphere was investigated by means of small balloons, which have shown the direction of upper currents to a height of six miles and temperatures up to five miles. An almost unbroken record of magnetic elements was obtained, and absolute magnetic observations were made every week. All through the winter the aurora was observed every hour, but few brilliant displays occurred. Atmospheric electricity also was studied. Pendulum observations for finding the value of gravity were carried out, and a tide gauge has given a continuous record.

Geology has received much attention. Problems regarding the origin of Alpine topography when Europe and other temperate regions were undergoing the Ice Age, are being studied in the examples offered by retreating glaciers in South Victoria Land, where this age still obtains. Above the Farrar Glacier, Debenham discovered a distinct crater of the late glacial age, also late basalt flows eighty feet thick: confirmation of the already known fact that there has been much volcanic activity in Antarctica. In the same neighborhood, the western party passed at one place a fresh water lake, frozen only at the surface. They also found a valley, described as a dry valley, where the glacier had apparently melted away before the rays of the sun. Near Granite Harbor, specimens of bituminous coal were found, also by Debenham, which were almost certainly derived from a well marked outcrop of beacon sandstone on the nunatak. This coal is of economic value and appears to be the second find of coal in the Antarctic, the first apparently being that made by Mr. Wild of Shackleton's expedition, who in 85° S., discovered seams of coal from four inches to eight feet in thickness with sandstone intervening.

Near the Mackay Glacier numerous well preserved fossils, probably crustacean, were found, which in connection with the several finds of fossils already made in Antarctica, tend to show that at one time life was more abundant there than now.

Biological work has been carried on steadily. Much was done at a hole kept open in the sea ice during the winter, where minute organisms were observed. Parasites of seals, of penguins and other birds, and of fish have been studied. Some new protozoa have

been found. On the *Terra Nova,* some trawling was carried out, through which a collection of the deep sea fauna of Ross Sea was made.

At Granite Harbor, thousands of wingless insects of two different species were observed clustering under the pebbles. The existence of insects in Antarctica was first revealed by Mr. Henryk Arctowski of de Gerlache's expedition, who discovered a tiny one in Gerlache Strait. The Borchgrevink expedition afterwards found three distinct types of insects at Cape Adare. Scott's party, however, is the first that has noticed insects in any numbers. It is not stated, however, what kind of insects they were, merely that they were half frozen. It would be of interest if they could be compared with the large red brown flies, nearly an inch long, which the Rev. G. F. Browne (*Ice Caves of France and Switzerland,* 1865, pp. 8, 42) saw running rapidly on the ice and stones of the Glacière de la Genolliere, and one of which he also found at the Glacière du Pré de Saint Livres, and which he was told was something very like the *Stenophylax hieroglyphicus* of Stephens.

An interesting zoological discovery was made at the Koettlitz Glacier. This drains off, like many mountain glaciers, through a stream flowing beneath glacier and moraine. But in this case it was found that seals proceeded up this subglacial river, and that their blowholes occurred at intervals along its course. It seems to be a new fact in natural history that seals sometimes go up a subglacial freshwater stream.

It is a lucky thing for science that Scott's expedition started when it did. After the discovery of the South Pole by Amundsen was announced, it would probably have been impossible to finance a scientific expedition to South Victoria Land. Scott's expedition, while not adding greatly to geographical knowledge, has certainly been most helpful to various other branches of science. It has been well handled under great difficulties, and from the scientific standpoint, it has been distinctly successful.

It seems well in this article to record the return of the Japanese expedition to the Antarctic under Lieutenant Shirase, in the *Kainan-Maru.* They left Sydney on November 19, 1911, and sailed straight to the Bay of Whales, where they landed a party and met the *Fram.* Thence they proceeded to Edward Land, where they landed another party, and then did some exploring along the coast. The two shore parties were then picked up and the *Kainan-Maru* returned to Wellington, New Zealand, on March 24, 1912. The details of the journey have not been published as yet.

There are some important facts, principally meteorological, on which the voyages of Amundsen and Scott have shed much light. These facts were known to some extent before now, mainly through the experiences of Nordenskjöld and Charcot. Probably they influenced Amundsen when planning his trip; at any rate they have profoundly affected the actual carrying out of the journeys of both Amundsen and Scott.

We know now that there are at least three great mountain ranges in Antarctica, that of South Victoria Land, that of Amundsen and Edward Land, and the Antarctic Andes of Eastern West Antarctica. These have the decidedly similar geographical characteristics of pointing in a general way from the neighborhood of the South Pole and of radiating towards the periphery of Antarctica much like the spokes of a wheel. Now the point to be noticed is that Scott wintered on the eastern slopes of the great mountain ranges of South Victoria Land, and Nordenskjöld on the eastern slopes of the Antarctic Andes. Amundsen wintered on the western slopes of the great mountain ranges of Edward Land and Amundsen Land, and Charcot on the western slopes of the Antarctic Andes. Nordenskjöld and Scott thus wintered in similar exposures; and Charcot and Amundsen likewise wintered in similar exposures. Scott evidently met extremely bad weather, heavy storms, blizzards, great cold, and Nordenskjöld had exactly the same experience. Amundsen, whilst noting some very low temperatures during the winter, speaks of but little snow and only two moderate storms, and this is much like what Charcot recorded. In other words, Nordenskjöld and Scott had frightful weather: Charcot and Amundsen had relatively good weather.

The inference is inevitable that this state of things prevails all over Antarctica and that the weather is more severe on the eastern slopes than on the western slopes of mountain ranges. Confirmation of this fact is even offered through occurrences noticed on Scott's own expedition. While the Western party was on the western slopes of the mountains surrounding the Farrar and Koettlitz Glaciers they had but little strong wind, although at Cape Evans very bad weather was experienced during the same period. Moreover, this fact tallies also exactly with the fact to which Dr. Hugh Robert Mill once called the writer's attention in a letter, namely, that the navigators who coasted along Antarctica from west to east had better sailing than those whose prows were pointed in the opposite direction.

From the journeys of Nordenskjöld, Charcot, Amundsen and

Scott, therefore, we may deduce with some assurance certain data about Antarctic weather conditions which must inevitably be taken into account in future voyages of exploration to the Antarctic regions. In fact, on the strength of these deductions, a guess may now be hazarded. Lieutenant Filchner is probably wintering somewhere under the lee of Coats Land. For aught we know to the contrary, there may be another range of mountains there pointing towards the South Pole; at any rate, it seems probable that Filchner will have better weather than either Nordenskjöld or Scott, and that this may aid him in breaking a new trail to the South Pole.

SOME GEOGRAPHIC RELATIONS ILLUSTRATED IN THE PRACTICE OF AGRICULTURE*

BY

RICHARD ELWOOD DODGE
Teachers College, Columbia University, New York City

The geography underlying agriculture may be viewed from two contrasted viewpoints. The larger problem is of course to consider the distribution of crops in a unit area as related to the climate, surface features, soil, labor supply and markets. For instance, with the climate, surface features and soil all favoring the development of dairying in a given section, whether that dairying shall be for furnishing fresh milk or for making butter or cheese, depends generally on the character and accessibility of the market. The distribution of wheat in the United States is dependent very largely on certain conditions of climate and soil, and the distribution of maize for food is dependent on the same conditions but with varying ratio between the values of the determinants.

The more detailed relations between agriculture and physical conditions, however, are equally interesting and perhaps at first sight less obvious. They are none the less real and important, however. Some of these relations, as seen in agricultural practice in the eastern United States, form the basis of this paper.

Slope and Exposure. In any region of varied relief, with contrasted slopes and exposure to sunlight and wind, agricultural

* Read before the Association of American Geographers, December, 1910.

operations must be adjusted according to the slope conditions. The distribution of hand versus machine operations in plowing, tillage and harvesting is largely a question of slope, though in the glaciated section of New England, the stony and ledgy character of the soil determines in many cases the form of tillage operations. The persistence of hand work in plowing, cultivating and harvesting of crops, like corn and potatoes, in New England is due in part to the small average size of the farms and in part to the steepness and irregularity of the slopes.

Here in general we find the gentler slopes devoted to tilled crops, the steeper slopes to fruit and the rougher regions to pasturage, scrub land and forests. Cattle can more cheaply and profitably harvest the natural crops of land nearly covered with boulders and with steep slopes, than can man either by hand or machine labor.

In any rugged or even rolling region, the question of water drainage and direction and rate of ground water movement is a vital matter from the crop standpoint. Farmers now generally recognize the importance of drainage as related to well or spring water supply, to the building of storage houses and in similar matters, but few yet realize that there is, in any region of varied relief, an air drainage as regular and as easily determined as is the water drainage. Houses on hillsides, if with the right exposure, will enjoy more air movement, both by day and night in the summer, than those located on hilltops or in valley bottoms. Furthermore, the extremes of temperature in summer or in winter are less on hillsides than in valley bottoms. This is the factor generally recognized by extensive market gardeners who fear the effects of early frosts or low nocturnal temperatures on the lower slopes in rugged regions.

In the northeastern United States the prevailing winter wind is from some point of the northwest and the prevailing summer wind is from the southwest, except in narrow and elongated valleys, where the lower currents are more or less influenced in their direction by the alignment of the surface features. Few farmers, however, realize the persistence of wind directions and pay little attention to this matter in the location of farm buildings or houses.

The question of exposure to sunlight is an important matter in gardening and fruit culture. In small gardens with many different crops, some naturally tall and some low in height, the rows should run north and south so that the tall crops will not shade the lower-lying plants, except for a few hours in the day. Plants raised in north and south rows will grow more symmetrically than those raised in east and west rows, because the plants receive equal hours of sun-

light on both sides and, furthermore, during the hottest hours before and after noon are less exposed to the intense sun's rays than they would be if planted in east and west rows.

Similarly the matter of exposure to sunlight explains why the best fruit is usually found in the higher parts of a tree, and why the next best is found on the south and southwest sides.

It is a commonly recognized principle that early and less hardy fruit trees should, in the Northern Hemisphere, be planted on north facing slopes, because such slopes are nearly tangential to the sun's rays during the midday hour, or may even be in the hill shadow while southern slopes may be nearly perpendicular to the sun's rays. Hence south slopes favor the early starting of trees, while northern slopes retard it, an important consideration in fruit culture in regions where the temperature may rise unseasonably high in the winter months and thus prematurely start the sap in delicate fruit trees.

Shade trees on the south side of tilled fields, though they may have their artistic value, are economically an unwise investment because of the effect of shade during the hours of the growing season, between 6 A.M. and 6 P.M. Field crops planted in the shade of east and west rows of trees are rarely successful, but those in the shade of north and south rows are somewhat more successful, for the influence of the shade is felt for less hours. Gardens sheltered from early morning sun, however, are always backward and disappointing.

The question of exposure is also a vital matter to be taken into consideration in the construction of farm outbuildings, as is recognized in certain cases. Cattle yards, sheep yards and hog runs ought naturally to be on the south side of buildings, or windbreaks, and at the same time protected from the northerly and westerly fair weather winter winds. Protection from the northeasterly and easterly winds is less significant, because these are usually storm winds, and stock will be kept under cover during storms.

The alignment of cow barns, horse stables, hog houses and hen houses ought to be considered from the standpoint of sun as well as wind exposure. Cow barns, planned for a double row of animals, should run in a north and south direction, so as to get the advantage of both the east and west exposures to sunlight. Henhouses, as ordinarily constructed, should run east and west so as to bring the scratching floors on the south side. Hog houses and cattle barns should be constructed so as to have the windows at the proper height, according to latitude, for securing the maximum amount of sunlight in the short days of midwinter. Improperly placed windows may

cut off all the sunlight from the stock or pens, when a proper consideration of the height of windows above the base line will throw the sun's rays where they are of most value. Some breeders of hogs prefer to have their windows adjusted so as to throw the light into the pens about the times of the equinoxes, which are the farrowing times for hogs.*

The much debated question as to whether it is desirable to have cattle in a double rowed stable face inward or outward, is not usually considered sufficiently from the standpoint of exposure to sunlight. Cattle facing inward in a north-south barn, with windows properly adjusted as to height, will receive the sunlight on their bodies rather than their heads and will not have their eyes exposed to such a strong glare as will animals facing outward. The question of exposure to light is equally important in horse stables, but usually horses are made to face the windows, an unfortunate arrangement from the standpoint of eyesight, warmth and comfort, particularly in the winter months.

Seasonal Weather Conditions. In general, successful crops during any year are roughly declared to be the effects of good weather and bad crops of bad weather, but few stop to analyze the special seasonal conditions that affect the crops or to consider what extremes of weather may be expected and whether the farmer can in any way be forearmed to meet such conditions.

Any locality is limited in its crop variety by the length of the growing season, which extends, for the main crops, from the date of the last killing frost in the spring to that of the earliest frost of autumn. Of course the length of the growing season varies with the latitude, altitude and position of a given region in reference to the ocean. Some years the growing season is several weeks longer than usual and in others it is shorter than the average, but the main crops in general are planted at about the same time each year and harvested at about the same date.

But the quality of a crop, and the quantity as well, are largely determined by possible variants within the growing season established on the basis of temperature alone. The seasonal distribution of sunshine and cloudiness may have a large effect on crops, and can not be anticipated or guarded against. The growth of corn, for instance, requires warmth and moisture directly following planting, but the character of the crop is determined by the daily temperature and sunlight during the season of rapid growth, previous to the

* For fuller consideration of this question, with tables showing height of windows for different seasonal exposures and different latitudes, see *Farmers' Bulletin*, 438 U. S. Dept. of Agric.

blooming of the corn. A warm July and August with an abundance of sunlight means taller stocks, better setting of ears and a large yield, while a cool and cloudy period at this season means the reverse. Warmth and moisture at or just after the season of blooming of potatoes means, as a rule, that more tubers will set and mature. A dry season at this time, no matter what the conditions during the rest of the season, means a light crop. Similarly the saying, "A wet May means long hay," has its truth, for plenty of moisture in the season of maximum growth followed by clear skies and seasonable temperatures, means not only a heavy crop of hay, but an early maturing crop and the right conditions for harvesting in the best condition.

A dry summer, immediately following the haying season, is unfavorable for the renewed growth of the grass, makes summer seeding of hay lands uncertain in results and causes a great loss of ground water from the soil by evaporation, because of the lack of a vegetation blanket on hayfields that would retard the rate of loss of ground water. Many other illustrations might be given of this intimate relation between sunshine, cloudiness, distribution of rainfall and success of crops.

Changes of weather conditions also affect animals in many ways worth noting. In the summer months where dairy cows are pastured in the ordinary wild pasture, they have to keep working to get as much food as is necessary for the greatest efficiency. Ordinarily cows will eat most freely in the early morning, in the late afternoon and on moonlight nights, if the weather is of the ordinary temperature and humidity. But on over warm and over humid days, cows will seek shade, and will not eat until driven to do so by hunger, and then they will eat sparingly. The indirect result of the excessive humidity is at once seen in the reduced flow of milk.

The same thing is true in the winter when cows are stalled and their food supply is regulated and constant. Where twice daily records are kept of the output of individual members of a herd, it will be found that the herd as a whole, and nearly every individual, will vary in amount of milk produced according to weather conditions, when the amount of food, the care, and other surrounding conditions are kept as nearly as possible unchanged. There seems to be a very direct relation between milk flow and excessive humidity, at both high and low temperatures. The flow will decrease more at times of severe cold and high percentage of humidity, than when the humidity is low and the temperature unusually severe. This is probably due to the well known fact, experienced by us all, that it takes

more energy to keep warm on cold, damp days than on much colder, dry days. In consequence of this extra demand on the energy of the cow to keep warm, there is less energy left for milk producing. Changes of humidity and temperature also seem to affect the efficiency of other animals, but it is not as easy to measure the results quantitatively, as is possible in a dairy herd.

Ground Water. The one element that is most vital to most crops is of course the ground water, whether it is at a high or low level and whether it can be supplied at the necessary rate for the growth of a given crop. The amount of water needed by various crops differs, and the depths from which crops can secure ground water also vary. Alfalfa, for instance, is deep rooted and especially adapted to countries where the ground water level is low. It is developed, therefore, with difficulty in heavy soils so situated that the ground water level is near or at the surface during many months in the year. Corn on the other hand is shallow rooted and the level of the ground water must be kept within reach of the roots. Hence the necessity of more tillage for corn and similar crops in dry seasons than in moist seasons. The methods of dry farming give any farmer the rule to adopt in crop management during dry seasons.

If the ground water level tends to lower, it must be retained near the surface by mulches or tillage. Conversely, if the ground water tends to remain too near the surface so that the land becomes saturated and cold, rolling and packing of the soil must be undertaken in order to increase the rate of evaporation from the surface of the ground.

The level of the ground water will rise in the autumn after a dry summer, without any rainfall because of the decreased evaporation with the lowering of the angle of the sun's rays. On this fact often depends the raising of the level of wells, the germination of fall cover crops and similar phenomena. Tillage is largely a question of maintaining suitable ground water conditions although it is not usually so considered. The method of tillage must therefore vary with the character of the season, and crops should be planted in soils where the physical conditions favor an average ground water level adjusted to the crop needs. In case of departure from mean conditions, systems of tillage must be adopted to counteract the unusual conditions.

Successful crop raising is largely a question of soil and ground water management in which, as has been illustrated by these scattered instances based on experience, geography has a large place, whether the geographic relation is so recognized or not.

RALPH STOCKMAN TARR

This well known American Geographer, Professor of Physical Geography at Cornell University, died very suddenly on Thursday, March 21, 1912, from cerebral hemorrhage. He had been indisposed on Wednesday of the preceding week from a cold and sore throat; but had so far recovered by Sunday as to be able to take dinner with Ithaca friends. On Monday, however, there was a relapse and other complications set in. His condition grew steadily worse from then on, though no fatal termination was looked for on Thursday morning. The end came with appalling suddenness on Thursday afternoon.

Professor Tarr was born in Gloucester, Mass., on Jan. 15, 1864. He received a public school education, entered Harvard University and was graduated from the Lawrence Scientific School of that institution in 1891, with the degree of B.S. In 1892 he married Kate Story. In the same year he was appointed Assistant Professor of Geology at Cornell University, and in 1896 was given the full professorship in Dynamical Geology and Physical Geography. Later, in 1906, he was made head of the Department of Physical Geography; and at the time of his death his title was that of Professor of Physical Geography. He is survived by his father and mother, his wife and two children, a son, Russell, now a freshman at Harvard, and a daughter, Catherine; and by a brother and three sisters.

Professor Tarr had won international recognition as a scientist and author by his research work in the field of geology and geography. His especial study was Glaciology and the Phenomena of Continental Glaciation. In connection with this work he early led an expedition to Greenland (1896) and more recently was the leader of four expeditions to the Alaskan glacier regions, to the last of which he devoted the summer of 1911, the previous ones the summers of 1905, 1906 and 1909. The first of these Alaskan expeditions was for the United States Geological Survey, but received part support from the American Geographical Society of New York; the second was wholly for the United States Geological Survey, and the last two were under the auspices of the National Geographic Society of Washington, D.C.

The results of this, and other work carried on by him, are, in part, embodied in a list of papers, monographs, and books, which will be printed when it is made more complete. Perhaps the most com-

prehensive paper on his glacial work is a Professional Paper of the United States Geological Survey entitled: "The Yakutat Bay Region, Alaska." He had a number of other papers in process of publication at the time of his death, the entire proof of one of which, another Professional Paper for the United States Geological Survey, entitled "Alaskan Earthquakes," had just been finally read and corrected by him at the time of his death. Professor Tarr was early an advocate of the effectiveness of glacial erosion, and his work on this topic, especially in reference to the geography and physiography of finger lake regions, has a classic significance.

In addition to the fame achieved by his research work Professor Tarr had also won renown as an educator and author of geography texts. His latest work of this nature, the "New Physical Geography," published in 1904, has secured a very wide acceptance in American schools.

He was an associate editor of the *Bulletin,* of the American Geographical Society and of the *Journal of Geography,* and was last year President of the Association of American Geographers. He was also a Foreign Correspondent of The Geological Society of London, and on Feb. 27 of this year, the Royal Geographical Society of Vienna conferred a similar honor upon him. Of this last honor he never knew, as the certificate reached Ithaca after his death. He was a member of The Geological Society of America and of Sigma Xi.

Taken in the prime of life (he was only 48 years of age), his death occasions a very great loss to the scientific world. His life had been spent in the acquisition of a very wide knowledge and experience in his subjects by exploration, travel and reading; and he was just entering on what would have been the time of his ripest productivity. Though science mourns him greatly, his scientific colleagues find in his untimely death an even greater grief in the irrevocable loss of a true and loyal friend and a very dear comrade. His personality was frank and delightful; he gave practical help to everyone with whom he came in contact; and to know him was to receive inspiration. To the younger men who grew up under his training he was over-generous in giving credit for work done under his guidance. Himself an indefatigable worker, he set for his students an example of industry and scientific activity difficult to emulate, but an ideal to be striven for.

O. D. von Engeln,
Cornell University.

Professor Tarr, for many years, had been a valued contributor to the *Bulletin.* Among his publications, numbering nearly 200 titles,

were many physiographical notes in our "Geographical Record." His "Physical Geography of New York State" was undertaken at the request of this Society, parts of it appearing in Volumes 28-31, before he published these papers, somewhat extended, in book form. (The Physical Geography of New York State; with a Chapter on Climate, by E. T. Turner, 396-7 pp. Maps, figs. New York, 1902.) In 1905 he received a grant from the Society to help him carry out, in conjunction with Lawrence Martin, research work at Yakutat Bay, Alaska, the results of which were published in two papers in Vol. 38 of the *Bulletin,* under the title, "Observations on Glaciers and Glaciation at Yakutat Bay, Alaska." Among other notable papers from his pen appearing in the *Bulletin* was "Decline of Farming in Southern-Central New York," which attracted much attention. It is expected to publish later in the *Bulletin* a fuller statement concerning his scientific writings.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

THE MARCH MEETING OF THE SOCIETY. A regular meeting of the Society was held at the Engineering Societies' Building, No. 29 W. 39th Street, on Tuesday, March 26, 1912, at 8.30 P. M. The Chair was occupied by Councillor Levi Holbrook.

The following persons, recommended by the Council, were elected to fellowship:

Percy Herbert Ashmead,	George F. Kunz,
Hugh P. Baker,	Frank B. Mackay,
L. A. Bauer,	Willis L. Moore,
John I. D. Bristol,	Hermann Norden,
Charles P. Bonnett,	James McAlpin Pyle,
Newton H. Harding,	William G. Reed.

The Chairman then introduced Lieutenant Charles F. Gammon, formerly of the U. S. Consulate in China and the Chinese Imperial University, who addressed the Society on "China." The lecture was illustrated by numerous lantern slides and was enjoyed by an audience that filled the Auditorium. On the adjournment of the Society the audience had an opportunity to meet the lecturer in the lower hall.

NORTH AMERICA

OIL AND GAS RESOURCES OF TENNESSEE. In its November number, *The Resources of Tennessee,* published monthly by the State Geological Survey of Tennessee, says that the Survey and the U. S. Geological Survey will cooperate in studies of the oil and gas resources of the State. Drilling is now going on in

several districts and favorable showing of oil has been reported from many fields.

POTASH FOUND IN THE MOHAVE DESERT. A large deposit of potash salts in the Mohave Desert of southern California has been reported by field men of the United States Geological Survey and the Bureau of Soils. Analyses of the brine in Borax or Searles Lake, in San Bernardino County, show 6.78 per cent. of potash, and the amount of the material available is known to be enormous. The potash, it is believed, can be used as fertilizer without employing any special reduction process, and the climatic conditions of the area are especially favorable to its separation and recovery by solar evaporation. Borax Lake is the last remaining pocket of a great ancient lake, which has almost dried up, thus concentrating a vast amount of saline minerals. Millions of tons of salt, soda, and borax cover the surface of the lake and deposits of soda and borax have been worked, but the development of the potash in the lake deposits had not been considered until recently.

IRON ORE RESERVES OF MICHIGAN. This is the title of an advance chapter by C. K. Leith, from "Mineral Resources for 1911," U. S. Geol. Surv. The report shows an estimated reserve in the mines of 124,598,164 long tons of high-grade ore—that is, what is known under present mining conditions as commercial ore—and of 44,982,938 long tons in drilled areas, or a total reserve of 169,581,102 long tons. The general conclusion of Dr. Leith's report is that at no time in the past has the outlook for long life for Michigan ores been any better assured than it is now.

RAPID GROWTH OF REGINA. A decade ago the present capital of Saskatchewan contained only a few hundred inhabitants. Regina is a good illustration of the rapid growth of some new Canadian towns. It is now a busy city of 30,000 inhabitants. It stands at the crossing of two great railroads. Buildings to the value of $5,000,000 were erected last year and it is said the building movement this season will be still greater. Over $1,000,000 has been expended on street and other improvements, the electric street car system, now seven miles long, is owned by the city, and the water works, now developing, will supply enough water for a population of 100,000 people. Regina is becoming a very important distributing center and its sales of agricultural machinery, amounting last year to nearly $5,000,000, have never yet been equalled by any other Canadian city.

RAILROADS IN ALBERTA. The Trade Commissioner for Canada reports that the government of Alberta has planned to guarantee bonds for the construction of 1405 miles of railroad to be built by Canadian Northern Railway Branch Line companies. These guaranteed lines of railroads will cover Alberta with a net work extending from Fort McMurray, on the Athabasca River, in the East, and Peace River Landing, on the Peace River, in the Northwest, to Pincher Creek in the Southwest and the international boundary south of Medicine Hat. (*Bd. of Trade Jour.* No. 798, March 14, 1912, p. 589.)

NEW FARM LANDS IN THE PEACE RIVER VALLEY. The Canadian Government has surveyed and thrown open an area in the Peace River Valley, thirty-four miles long by twenty-four wide. The region is declared to be one of the best agricultural districts in that valley. Its nearest railroad point is Edson on the Grand Trunk Pacific Railway, which is now the largest station on the line west of Winnipeg.

THE TWENTY-FOOT TERRACE AND SEA CLIFF OF THE LOWER ST. LAWRENCE. Professor James Walter Goldthwait writes (*American Journal of Science,* Oct. 1911), that this terrace and sea-cliff is not only the best cut and sharpest of all the elevated beaches and sea-cliffs on the upper Saint Lawrence, but the only sharp and well-cut one. Each of the other beaches—and they occur all the way up to 630 feet above the river—is so slightly marked that we must suppose that the warping uplift was steady and without pause from the time the ice began to draw away from the region to the date of the twenty-foot cliff. This Prof. Goldthwait christens the Micmac. It is strong because it was cut during a long, slow submergence, which gives the sharpest possible cliff-cutting, just as occurs in the Nipissing beaches of the Great Lakes. The paper shows the advantage that Goldthwait possesses in his wide as well as close study of lake shores. He finds that a similar interruption of emergence by depression has been made out in Scandinavia, which may be contemporaneous with this in America.

MARK JEFFERSON.

THE NEW PORT OF PRINCE RUPERT. The *Canada Gazette* for March 30, contains a proclamation announcing the establishment as a public port of "all the waters of Prince Rupert Harbor, including Tuck Inlet, Lake Wainwright, and the Porpoise Harbor with connecting and tributary waters." Prince Rupert is the terminus on the Pacific of the Grand Trunk Pacific Railway.

SOUTH AMERICA

RUBBER INDUSTRY IN BRAZIL. The competition of the rubber plantations of the East Indies has been so successful that extraordinary measures will have to be taken to keep the industry on its feet in the Amazon basin. The Brazilian Government proposed to waive the import tax on all implements used in extraction of rubber, to provide prizes for the establishment of new plantations, to found experimental farms in almost every province, to give free instruction and free seed to all interested in rubber culture, and to grant subsidies for the installation of factories for the manufacture of pure rubber at Manaos and Para (*Daily Consular and Trade Rept.,* No. 19, Jan. 23, 1912). These plans may not be realized for some years to come, but it is of great importance to know that big projects are under way, for if the Government takes the same paternal attitude toward the rubber industry that it has given to the coffee and sugar industries and the related question of immigration and colonization, we shall soon see fundamental changes. It is planned to grant subsidies for railway construction and to build a series of roads in strategic positions to supplement the present system of fluvial transportation. Steamers will be put on many rivers and coal depots established at inland points. The Government will undertake direct colonization, hold a triennial exhibition at Rio de Janeiro, and make a reduction in the, at present, very burdensome export tax on rubber.

ISAIAH BOWMAN.

FUEL RESOURCES OF THE CENTRAL ANDES. The lofty semi-arid plateaus of the Central Andes have many resources of great value to men, though, up to the present, modern business has suffered because of the absence of a native coal supply. Recently there has been reported (*Daily Consular and Trade Report,* No. 35, Feb. 10, 1912) an apparently large and rich coal deposit near Lake Titicaca. The fact that the greater percentage of the fuel used at the present time is brushwood and llama dung and very expensive coal, lends great interest to the reported discovery. Coal is now imported from Wales, New South Wales,

Australia, and from Germany and Belgium. This is true even of the coal used by the Pacific Steam Navigation Company's steamers, though the newly organized Peruvian Steamship Company buys its coal at Panama. Oil deposits of possibly great value have also been discovered north of Lake Titicaca, and, from reports gathered during the past year, there is a possibility that its development will not be long delayed, since the ease with which it may be handled gives it a great advantage over coal. Reports of coal deposits on the west flank of the Andes in northern Chile east of Tacna and near the line of the new railroad from Arica to La Paz, have also been received and some of this coal on examination proves to be of sufficiently high grade for steamship and railroad use. While coal deposits have been reported from several points in Peru, none has yet been discovered in Bolivia, so that from the standpoint of that country the Tacna and Titicaca reports have special interest. ISAIAH BOWMAN.

POLAR

THE CROCKER LAND EXPEDITION. The Steam Whaler *Diana,* a barkantine of about 500 tons register, has been chartered to carry the Crocker Land party to the south side of Bache Peninsula (Flagler Bay) or as near it as the ice will permit (*Bull.* March, 1912, pp. 189-193). Purchases of supplies and equipment are now in progress on the basis of providing food for five or six men for three years. The largest single items of food supply are 14,000 pounds of pemmican and 35,000 pounds of dog biscuit. The latter will be used at winter quarters instead of the whale meat provided by earlier expeditions.

A full photographic outfit is included. Among the instruments to be taken are barographs, thermographs, anemometers, etc., in addition to the ordinary instruments for determining geographical position. The surgeon and the scientific assistant have not yet been selected. While it may now be definitely announced that the expedition is going this year, all the money needed has not yet been secured and additional subscriptions are earnestly desired.

POLAR MEETING AT THE AMERICAN MUSEUM OF NATURAL HISTORY. The American Museum of Natural History and the American Geographical Society celebrated in the auditorium of the Museum on the evening of April 5, the attainment of the South Pole by Captain Amundsen, the third anniversary of the achievement of the North Pole by Rear-Admiral Robert E. Peary and the recent inauguration of the Crocker Land Expedition. A very large audience listened to speeches by President Osborn of the Museum, Vice-President Greenough of the American Geographical Society, Rear-Admiral Peary, representatives of the Philadelphia and National Geographic Societies and others. An interesting feature was the presentation to Admiral Peary by the Peary Arctic Club of its medal of honor.

A REMARKABLE SUMMER JOURNEY IN ARCTIC SEAS. A letter was read at the meeting of the Real Sociedad Geografica on Nov. 14, 1911, from Señor D. Francisco Gisbert [a summary of his plans is in the *Bulletin,* 1911, p. 859], giving a short account of his voyage in Arctic seas last summer. (*Bol.* R. Soc. Geogr., Vol. 9, pp. 41-47, Madrid, 1911.) On July 1 his party sailed from Tromsö headed for Jan Mayen. Ice was met, a few days later, forty nautical miles east of Jan Mayen. This was recorded as an unusual extension for that season. A few days were spent at Mary Muss Bay and excursions were made inland. Señor Gisbert says that in the four years since his last visit many changes due to the volcanic nature of the island have taken place. The lake near Great

Wood Bay, which was six kilometers wide, had totally disappeared. The land was found to be ten meters higher above sea-level.

On leaving Jan Mayen the expedition sailed towards Shannon Island, on the east coast of Greenland above 75°. The enormous quantity of ice proved to be a serious obstacle to the trip. The explorer says he never saw so much ice in July and the conviction grew on him that he would not reach the coast. However, on July 27, after continual struggle with the ice, the coast of Greenland as well as Sabine Island south of 75°, were sighted. Owing to arrangements made for the party's return to Tromsö on Aug. 10 at the latest, no attempt was made to land. Tromsö was reached on Aug. 4.

Señor Gisbert left Tromsö again on Aug. 14 for the North. Ice was met in 75° 30′ N. The southern islands of Franz Josef Land were sighted twice, but thick ice prevented landing. The explorer finally succeeded in following an open channel which led to Cape Flora, and Jackson's station there was visited. The outlook from the summit of a nearby mountain showed favorable conditions for an attempt to cross Miers Sound and attain the British Channel. In this channel the party found an unmapped island, the bearings of which were determined. The island is a half mile long and 500 meters in width. Details as to its exact location, formation, etc., are promised by the explorer. The British Channel was followed nearly to 81°. No attempt was made to reach Teplitz Bay (81° 47′ N.), on account of weather conditions and, furthermore, ice was forming rapidly. It was decided to return by way of De Bruyne Sound. On leaving this passage it was found that ice conditions permitted extending the trip somewhat and the ship was headed East towards Wilczek and Salm islands. Hardly had the former been attained, however, when a severe snowstorm forced the ship south. Much difficulty was experienced in getting out of the ice. Finally open water was reached near 77° N. and Norway was attained on Sept. 10.

This was certainly an unusual trip for a season of rather poor ice navigation. To have reached nearly 81° N. in Franz Josef Land, to have spent some time on Jan Mayen in the same month that the Duchess of Bedford's party was prevented by surf from landing (*Geogr. Journ.*, Vol. 38, Nov., 1911, p. 537) and about a month earlier than the vain attempt of the Stackhouse Expedition to land in Mary Muss Bay, defeated, as it was, by heavy seas (*Bull. Amer. Geogr. Soc.*, Vol. 43, Dec., 1911, pp. 881-890), and to steam within sight of the East Greenland coast and back to Tromsö, all within two months and ten days and in spite of very bad ice on the Greenland trip, make a series of achievments worth recording.

A New Greenland Expedition. Captain Koch, who was with the Mylius Erichsen Expedition in 1906-08, will lead a party to Greenland this year and will attempt, in 1913, to cross the inland ice from the east to the west coasts. The expedition expects to land at Königin Luise Land, an ice-free stretch of the coast about 90 miles north of Cape Bismarck. The inland ice does not extend to the coast here, but is held back by high mountains so that the comparatively wide coastal strip is richer in plant and animal life than any other part of the east coast, as far as known. It is expected to make thorough studies in this region and in the spring next year to begin the march over the inland ice with the design of penetrating to Lachsfjord near Upernivik on the west coast. The journey of about 630 miles will be across one of the broadest parts of Greenland and is expected to take from two to three months. (*Geogr. Zeit.*, Vol. 18, 1912, No. 3, p. 171.)

RUSSIAN TRADING POST IN NORTH NOVAYA ZEMLIA. An article by B. I. Sadovski (*Izviestiia* of the Archangel Society for the Exploration of the Russian North, Vol. 4, 1912, Nos. 1-4), says that a new settlement was founded on Novaya Zemlia in 1910. As the Russian government is anxious to strengthen its authority on these islands, particularly to protect the northern island from the encroachment of foreigners, it appropriated funds for the establishment of a trading post in Cross Bay, 74° 10′ N. Lat. The erection of a large house, a chapel, and a bathing pavilion began in July, 1910. The colonists—Russian peasants, eleven in all—are supplied with food, boats, fishing implements, fire-arms and clothing. This is the first Russian trading post on the northern island and the fourth settlement on Novaya Zemlia, with 103 inhabitants all told. The colonists showed good results in 1910. Merchants from St. Petersburg and Moscow were invited to attend the sales; particularly high prices were realized on arctic fox and bear skins, and the total amounted to over $10,000.

H. DE H.

PHYSICAL GEOGRAPHY

THE CYCLONIC UNIT IN RAINFALL OBSERVATIONS. The usual method of observing and of averaging rainfalls, by days, months and years, while it has its obvious advantages, is from many points of view unsatisfactory because it does not show causes and conditions of the rainfalls. In the greater part of the so-called "temperate" zones the study of the amounts of rainfall which occur in connection with different individual cyclones makes the whole subject far more vivid and also far more rational. In a given month we have a rainfall below the normal. In another month we have a rainfall well in excess of the normal. What caused the difference? The usual monthly summary simply shows the fact. A study of the rainfalls of these two months by cyclones shows at once that the difference in the two cases was the result of a difference in the number, or tracks, or intensity, of the cyclones which brought the rainfall.

In a paper on "The Cyclonic Distribution of Rainfall in the United States" (*Monthly Weather Review*, Oct., 1911), William G. Reed, of the University of California, has published the first general study of this kind for the United States. Previous investigations in this country along similar lines have been made by Loomis, by the New England Meteorological Society, and by others. The author gives a brief account of what has been done by others in this direction, particular attention being paid to the excellent maps and discussions of cyclonic rainfalls in Great Britain published by Dr. H. R. Mill. The method of work in the present case was to enter, on a blank map, the sum-total of the daily amounts of precipitation due to a given cyclone as the depression moved across the United States, and then to draw isohyets for "trace," 0.5 inch, 1.0 inch, and 2.0 inches. Sometimes higher values than 2.0 inches were used. The maps, when completed, show the amount and the distribution of precipitation by cyclones. Considerable difficulty was naturally experienced in separating different cyclones, in dealing with thunderstorm rains, and in other matters. Yet, in spite of these handicaps, and in spite of the fact that the data studied covered only a comparatively short period of time and are obviously far from complete, the results of the investigation are important. The irregularity in the distribution of the heavier and lighter rainfalls is a very striking feature, as shown in several selected typical charts. It would be well if such a study could be carried much further, to cover a long period of years, based upon the daily rainfall

records of the thousands of volunteer observers of the Weather Bureau, and if the causes of the "patchy" distribution of rainfall could be worked out. This paper is along new lines for this country, and is, obviously, only a beginning.

R. DEC. WARD.

MAGNETIC SURVEY WORK OF THE CARNEGIE INSTITUTION. The magnetic survey vessel *Carnegie,* left Manila on March 23, under the command of W. J. Peters, bound for Suva, Fiji, whence she will proceed across the Pacific to San Diego, Cal., arriving there towards the end of June. From San Diego the vessel will go to Tahiti, crossing the tracks of the former vessel, the *Galilee,* and filling in gaps; next to Coronel, Chile, then around the Horn. Finally, after having completed the general survey work in the South Atlantic Ocean, she will return to New York towards the end of 1913.

Magnetic Observer Kidson is now making magnetic observations in the western part of Australia in continuation of the general magnetic survey of Australia. Mr. J. P. Ault was placed in charge of a South American party, consisting, besides himself, of Donald Mackenzie and H. R. Schmitt. The party left New Orleans on March 30 and will make magnetic observations chiefly in Peru, Bolivia, Paraguay and Uruguay. Magnetic Observers W. H. Sligh and D. W. Berky are carrying on the general magnetic survey of the northwestern part of Africa. In connection with the total solar eclipse of Oct. 10, 1912, the belt of totality of which passes through Ecuador and Brazil, arrangements are being made to have two or three parties at suitable points along the belt for magnetic and electric observations during the time of the eclipse.

PERSONAL

PLANS OF SOME AMERICAN GEOGRAPHERS FOR THIS SUMMER. Avard L. Bishop, of Yale, intends to travel in Western Canada to study the agricultural resources of the three prairie provinces and to collect information on marketing crops and other matters of commercial and economic significance.

Isaiah Bowman, of Yale, will be in New Haven until Aug. 15, working up the geological and geographical data of the Yale-Peruvian Expedition and writing his report on it. Later, he will accompany the Transcontinental Excursion of our Society.

Robert M. Brown, State Normal School, Worcester, Mass., includes in his summer programme the study of shorelines, particularly in reference to shore drifts along Narragansett Bay, Martha's Vineyard, etc.

Frank Carney, Denison University, O., will continue his field work for the Ohio Geological Survey, mapping the old shorelines of the ice-front lakes. The survey is doing this work in great detail. Mr. Carney has mapped the raised beaches from the Pennsylvania State line west to near Leipsic. He has given three seasons to the study of these old shorelines and their geographical interpretation and the work will occupy at least two more seasons.

G. C. Curtis of Boston, will probably continue his studies of the Atlantic coast line which he began fifteen years ago with the discovery of ancient sea margins on Monhegan Island, coast of Maine. During the past two summers the coasts of Nova Scotia, Cape Breton, and southern Newfoundland were studied in detail.

Richard E. Dodge of Teachers College, Columbia University, will take part in the Transcontinental Excursion.

N. M. Fenneman, University of Cincinnati, has completed the pleistocene

and economic portion of the Cincinnati Folio for the U. S. Geological Survey. Dr. E. O. Ulrich is doing the paleozoic work and as soon as his task is completed the Folio, which will be a very large one, will be published. Mr. Fenneman is now engaged on the Hamilton-Mason (double) Folio, which covers the area next north of the Cincinnati quadrangles. He will be a member of the Transcontinental Excursion.

J. Paul Goode, of the University of Chicago, will give two courses in the summer school at that institution, one on the economic geography of our country and the other on the economic geography of Europe.

William H. Hobbs, professor of geology at the University of Michigan, has been appointed by President Hutchins to represent the University at the 250th anniversary of the Royal Society of London, which will be held from July 16 to 18. Prof. Hobbs has leave of absence for the school year 1912-1913. Prof. E. C. Case will have charge of the Department of Geology. Mr. Hobbs's classes in geology will be conducted by Frank Carney, of Denison University. Mr. Hobbs will devote the year to study and travel abroad. In his field studies this summer he will pursue especially two lines of investigation: One of these is concerned with the nature of weathering at the bottom of the Bergschrund of Swiss glaciers, and the other, to the relation between relief of the land and joint structures. For the latter study he intends to visit Malta, the Balkan Peninsula and the Egyptian Desert.

George D. Hubbard, of Oberlin College, will lead a party of students into Western Virginia, where New River cuts through the Appalachian Mountains. The rocks from the Cambrian to the Mississippian, fifteen formations in all, are exposed in this neighborhood, and large and small faults, mineral deposits, and zinc, lead and copper mines may be studied by the students.

Ellsworth Huntington arrived in Havana, Cuba, from Yucatan early in April and expects soon to return to New Haven. He had written earlier that he hoped to spend six or seven weeks in Mexico visiting certain ruins and enclosed lake basins, among them that in which the City of Mexico lies. When the city was founded it contained a lake that has been drained by the digging of a tunnel. He desired to study the old strands of the lake and any features indicative of former expansion. Later he hoped to go further south to study the large terraces that are said to flank many valleys on the dry, west side; also to get some idea of the ruins at Oaxaca and Mitla, especially to see whether terraces had in any case been formed since their construction. From Mitla he planned to cross the Isthmus of Tehuantepec and go by land to Yucatan. There he would examine the great ruins of the Mayas to see how far their physiographic conditions are like those of Mitla. This summer he expects to spend June and July among the Sierras, making further measurements of the rate of growth of the Big Trees. He will take a machine for boring horizontal cores from the trees and, if it works successfully, will be able to bring back sections from living trees.

Douglas Wilson Johnson, Assistant Professor of Physiography at Harvard University, has been appointed Associate Professor of Physiography at Columbia University. He is now spending a half year in Europe and will begin his service at Columbia by giving two courses on Geography in the Summer School, which will open in July.

Walter S. Tower, of the University of Chicago, sailed from New York, on March 20, for South America, where he intends to spend six months studying the economic geography of Argentina, Chile and southern Brazil.

R. DeC. Ward, of Harvard University, will begin work on his book on the "Climatology of the United States" as soon as the college term closes in June. Later he will take part in the Transcontinental Excursion.

PRESIDENT OF THE GEOGRAPHICAL SOCIETY OF LIMA. Engineer José Balta has been elected President of the Geographical Society of Lima for 1912.

GENERAL

DROUGHT AND BUILDINGS. The drought of the summer of 1911, in England, caused widespread and expensive damage to buildings, as reported in *The Builder* for January 5, 1912. In cases where foundations rested on clay, the drying of the clay necessitated underpinning in hundreds of cases in and about London. Whereas, in ordinary summers, the clay is quite moist at a depth of 2.5 to 3 feet below the surface, during the past summer it was often perfectly dry at depths of 5 and 6 feet. The dry clay became powdery and when the autumn rains began, the water found its way into the fissures and washed out the clay. Thus sliding or lateral movements took place. The study of such weather effects upon the clay soils emphasizes the importance of having a depth of foundation which reaches below the level affected by snow and rain, and of carrying all the foundations to a uniform depth. In more than seventy cases of the settling of buildings studied by the author of the article in *The Builder*, there were only two or three cases in which fractures occurred where the foundations were at a uniform depth. R. DEC. WARD.

PHOTOGRAPHING RED SNOW IN NATURAL COLORS. A meteorological photograph of very unusual interest was taken by Mr. Ford A. Carpenter, Local Forecaster of the U. S. Weather Bureau at San Diego, Cal., in July, 1911, during a camping trip of the Sierra Club. The photograph, which is the only one of its kind, shows the phenomenon of "red snow" in natural colors. It was taken by the Lumière process. The red snow first attracted attention because the hoof prints of the pack animals, which were plunging through deep snow in the snowfields on the saddle of the Vogelsang Pass, were observed to be "splotched with red as if the snow-crust had cut the mules' feet and dyed the snow with drops of blood." The picture, which is admirably reproduced in the *Transactions of the San Diego Society of Natural History*, Vol. 1, No. 3, pp. 108-111, was taken on the summit of Lambert Dome. Mr. Carpenter's notes say: "It looks as if carmine ink had been spilled over the snow." R. DEC. WARD.

USEFUL OLD MAPS. Sir Herbert George Fordham recently read a paper, "John Cary, Engraver and Map-seller, 1769-1836," before the Cambridge Antiquarian Society, England, in which he said that Mr. Cary was engraving maps and plans earlier than 1783, his publications marking a decided advance in the art of cartography in England. Of his maps and atlases the three sets of the English and Welsh counties, which went through many additions, are the best known. The plates of these maps still exist and the county maps of the folio atlas give so good an outline of the roads, and are so clear and satisfactory in their details, that they are, even now, though more than a century old, being printed and published for the use of motorists.

DR. BAUER'S TRIP OF INSPECTION. The *Bulletin* mentioned (Feb., p. 119) the return to Washington of Dr. L. A. Bauer after a nine and a half months' trip of inspection of the magnetic work being conducted, under his direction, on board the *Carnegie* and by land expeditions in Australia and Asia. *En route*

he visited the magnetic observatories at Apia, Christchurch, Melbourne, Mauritius, Kodaikanal, Bombay and Alibag, Dehra Dun, Barrackpore, Toungoo, Batavia and Buitenzorg, Hongkong, Manila and Antipolo, Zi-ka-wei, Tsingtau, Tokio, Honolulu and Tucson, Arizona. He also conferred with various government officials and scientific organizations and made arrangements regarding co-operative magnetic survey work. He observed the total solar eclipse of April 28, 1911, at Tau Island of the Manu group, having been favored with clear weather.

OBITUARY

A. Lawrence Rotch. Professor Rotch died in Boston on April 7 at the age of fifty-one years, leaving a wife and three children. His father's family were among the founders of New Bedford and his mother was a daughter of Abbott Lawrence, formerly Minister to England. Young Rotch spent much of his youth in Europe, and, on returning to America, he entered the Chauncey Hall School, where he was prepared for the Massachusetts Institute of Technology, in which he took the course of mechanical engineering and graduated in 1884.

That year he begin to build the Blue Hill Meteorological Observatory, with which his name has been associated, and in which the first observations were made on Feb. 1, 1885. Its annual observations have been published in the *Annals* of the Observatory of Harvard College. He set a pattern to meteorologists and adopted the international system of records before they came into use at Washington. At Blue Hill he first introduced the use of kites in exploring the upper air and became especially noted for his studies by means of kites and balloons. He obtained the first observations high above the Atlantic with kites in 1901 and the first observations, five to ten miles above the American Continent, with registration balloons in 1904. In 1905 and 1906, he collaborated with Teisserenc de Bort in sending a steam yacht to explore the tropical atmosphere. The efforts he made to advance knowledge of the upper air were recognized by honors awarded to him by learned societies and governments. Harvard gave him the A.M. degree and made him assistant in the Harvard Observatory. He also took part in scientific expeditions to South America, Europe and Africa. He was the author of "Sounding the Ocean of the Air" (1901), of "The Conquest of the Air" (1909), and of many articles in scientific journals.

Prof. Dr. Richard Andree. This ethnographer and geographer died on Feb. 22, in his 77th year, while on the way from Nuremberg to Munich. His father was the founder of *Globus* and the son became its editor in 1891 and placed it in the first rank of ethnographical periodicals. His writings in his favorite field and on geographical topics, were widely read; and he was closely associated with the production of the famous "Andree Handatlas" and other cartographic products published by Velhagen & Klasing in Leipzig.

Prof. Albert Scobel. This well-known cartographer is dead at the age of 61 years. He was the successor of Richard Andree as superintendent of Velhagen & Klasing's geographical establishment in Leipzig and in the editorship of the Andree Handatlas. The fifth edition of his very useful "Geographisches Handbuch" in two volumes appeared in 1910. He published a Commercial Atlas, many school atlases and was one of the best representatives of German cartography.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

The Arctic Prairies. A Canoe-Journey of 2,000 Miles in Search of the Caribou; being the Account of a Voyage to the Region North of Aylmer Lake. By Ernest Thompson Seton. xvi and 415 pp. Ills. and index. Charles Scribner's Sons, New York, 1911. $2. 9 x 6.

Seton's trip was on the Athabasca R., and the book is a detailed description of the plant, animal and human life along the river. The farthest north of the journey was Lake Aylmer in 64° N. Lat. The explorer planned to see the caribou migration, to prove the abundance of this animal, to explore and map Lake Aylmer, which Back had roughly sketched, and to reach the land of the musk-ox; in all these points he was successful. A large number of observations are recorded in pen sketches and text of the animal and plant life. Most of the book is a narrative of the journey, but in the appendixes are records of the natural vegetable growth of the country, a brief account of the soil and climate, results of the little cultivation attempted, a summary of observations of the buffalo and yak, lists of the insects and notes on plants, mammals and birds. The book is recommended as a source of information as well as of enjoyment.

R. M. Brown.

The Leading Facts of New Mexican History. By Ralph Emerson Twitchell. Vol. I. xx and 506 pp. Maps,* ills., index. The Torch Press, Cedar Rapids, Iowa. 1911. $6. 10 x 6½.

To judge by its first volume this work deserves a prominent place among important contributions to our knowledge of the Southwest. Beginning with the earliest known period of man in New Mexico, the author brings out compactly the salient features of New Mexican archæology. Due recognition is given to the great rôle played by physiographic and geographic factors as determinants of the proto-historic civilizations which flourished long before the advent of the Conquistadores, and an important place is assigned to the hydrographic factor. The map on page 5 shows clearly how human life was able to thrive in the heart of valleys still in the stage of fluvial erosion. Other physical determinants have not been taken up with much detail, but the reader will be able to make more than one important deduction in this field, thanks to concise descriptions of the various modes of life.

The transition to Spanish times is marked by a marvelous feat in American exploration—the transcontinental trip undertaken by Alvar Nuñez Cabeza de Vaca and his companions, with which the second chapter begins. From Mr. Twitchell's map it appears that New Mexican territory was traversed from its modern eastern frontier to a point near the western state line and not far from

* Listed under "New Mexico," "United States-Mexico" on p. 316, and under "Historical" on p. 320.

the present international boundary. The author has evidently based his map on data derived from Cabeza de Vaca's *"Relacion."* The degree of accuracy attained in tracing the route accordingly depends on the correlation of Vaca's information with our present knowledge of New Mexican geography. Mr. Twitchell's critical care is amply evinced by the discussions accompanying the narrative.

The description of this epoch-making episode is the prelude to a detailed description of some momentous events during the sixteenth century. Of course, the book could not have been confined to events occurring merely within the present boundaries of New Mexico; and Mr. Twitchell does not fail to show how intimately the early history of New Mexico is interwoven with the thread of Spanish activities. After Mexico City became the Spanish Viceroy's capital, a number of exploration parties were sent out in rapid succession by the Spaniards. Beginning with Nuño de Guzman's expedition, the writer treats them chronologically and dwells particularly on the fate of the explorers in New Mexico. Copious footnotes throughout the text impart further clearness to the account. A whole chapter is devoted to Coronado's invasion of the North. Geographers and geologists alike will note with interest the reference made to the discovery of the Grand Canyon of the Colorado by Don Garcia Lopez de Cardenas.

Mr. Twitchell ably sets forth also the extraordinary activity of the Spanish friars. It was the cross that was often planted in token of Spanish suzerainty before any royal standards were unfurled. The harvest of souls was as potent an impelling factor among the various religious orders that supported many of these expeditions, as the lure of the precious metals was to the layman.

As to the origin of the State's name it is asserted that Ibarra, on returning from the expedition undertaken in 1563, boasted that he had discovered a new Mexico, and "it is not unlikely that from this circumstance the name came to be applied in later years." The author shows that the name was given at first to a region far more extensive than that now covered by it.

About this time the conquest of the northern territory was decided upon, and Don Juan de Oñate accomplished it near the close of the sixteenth century. Even then the power of the conquerors was somewhat shadowy, which is not surprising in view of the distance between New Mexico and the seat of government. The details of the Pueblo rebellion and independence are given sufficiently to reveal the real feeling among the Indians. The final success of the Reconquistadores put an end to native attempts to throw off the foreigner's yoke. The eighteenth century came in with the Spaniards firmly entrenched in authority. The one hundred and twenty-two years of their rule, during which peace stimulated trade, are reviewed. The author briefly alludes to New Mexican industries at the beginning of the nineteenth century. More space might well have been devoted to so important a phase of New Mexico's development. The volume closes with an account of the expedition of Major Zebulon M. Pike and the rejoicings when the news of Mexico's independence were received at Santa Fé. The bibliography at the end of each chapter and the illustrations are good.

LEON DOMINIAN.

Highways of Progress. By James J. Hill. x and 354 pp. Index. Doubleday, Page & Co., New York. 1910. 8 x 5½.

This is a book on conservation by one who has done more than his share in the development of our great Northwest. It is divided into thirteen chapters

and considers many different topics, devoting a large share of attention to agriculture, to old and new farm methods, commerce, industrial and railroad foundation, to Oriental trade, irrigation and drainage, waterways and the railroad. While it is written sometimes in a pessimistic tone, it is in reality an optimistic book. It is written from a large viewpoint and with a long look ahead. It shows that the author has read widely and is more than interested in the larger problems that face the country, of which his own special section is only a small part. The book is geographic in tone in that the author pays a good deal of attention to the relation between human conditions and the physical conditions which have influenced or controlled them. The book has been very clearly written, the style is pleasing, and while statistics are used freely they are used in such a way that the general reader is not embarrassed by them. The book deserves to be read by all who are interested in the promotion of the industries of their country or the conservation of its natural resources.

RICHARD E. DODGE.

SOUTH AMERICA

[Following the Conquistadores] Along the Andes and Down the Amazon. By H. J. Mozans. With an Introduction by Colonel Theodore Roosevelt. xx and 542 pp. Map,* ills., bibliogr., index. D. Appleton & Co., New York. 1911. 9 x 6½.

An earlier volume by this author is entitled "Following the Conquistadores Up the Orinoco and down the Magdalena." It is a little difficult to find two other volumes on South America so replete with historical allusions and so thoughtfully written. History is the main theme; the author's journeys and experiences are always subordinated to the story of the great Conquistadores. The opening chapters relate to Panama, La Paz, Cuzco, and southern Peru. The most important parts of the book are found in chapters 16 to 24, inclusive, where the author is in newer territory. His descriptions of travel conditions are subordinated to serious geographical and archæological considerations, and we are made to realize the difficulties of the Conquistadores, whose steps the author follows in his journey across South America. The three chapters of greatest interest are 19, 23, and 24; the two last, entitled "Romance of the Amazon" and "Sailing Under the Line," are among the most attractive ever written describing the great river of northern Brazil.

In a number of places explanations of physical phenomena are unfortunately weak; as for instance, the explanation of the arid west coast of Peru, where the Humboldt Current is made to collect moisture from the overlying air and thus in some way give rise to arid conditions on the land. The Humboldt Current is indeed related to the aridity of the west coast of South America but not in so simple a manner as this. The implication on page 116 that Peru has been thoroughly surveyed and the statement on page 498 that the fall of the Amazon for the last 2,000 miles of its course is but little more than an inch to the mile are illustrations of a tendency to incorrect generalization.

We have also to object to the statement on page 526 that the author has "proved that one may traverse even the wildest and least populated parts of South America with comparative ease and comfort." It will strike many with surprise to find this statement in a book so excellent in other respects. As a matter of fact, the author was almost continually in touch with human habitations,

* Listed under "Peru-Brazil, etc." on p. 317.

a fairly good native food supply, and at Iquitos was able to secure an ocean steamer for four-fifths of the journey across "one of the wildest" (?) parts of South America. If we use this term for the route from Truxillo to Iquitos and Pará, what resources of language are left to describe the travel conditions in the really difficult sections of the Amazon Valley, the Andes Mountains, etc., where food supplies are wanting and population either absent or hostile?

On the other hand, it is not desired to obscure in the slightest degree the really great value of the book to all students of South America. We have rarely seen so delightful a blend of geography and history as these pages exhibit. The book clearly illustrates how much more illuminating an historical presentation becomes (especially when it deals with wide spaces) if the author takes the trouble to visit the field and gather first-hand impressions of climate, relief, vegetation, etc., and thus reconstruct in their proper geographic environment the schemes of a past age. Judging the work from this standpoint, it is one of a very small class of books containing real contributions to the interpretation of historical events determined in part by geographic conditions. On the whole, it has been remarkably well done, and like Dr. Mozans' earlier book on the Orinoco, it forms one of the most substantial contributions to Latin-American literature of the past quarter-century. ISAIAH BOWMAN.

A Search for the Apex of America. High Mountain Climbing in Peru and Bolivia, including the Conquest of Huascarán. With Some Observations on the Country and People Below. By Annie S. Peck. xviii and 370 pp. Map.* ills. Dodd, Mead & Co., New York. 1911. $3.50. 9 x 6.

The expanded title covers the story of this book. When so definite a task as the ascent of a mountain is the all-absorbing goal of one's ambition, it is unfortunate that the public must read, in order to get a first-hand account of the undertakings, so much of journeys, visits and conditions of life which form the incidental features. Fifteen out of the twenty-seven chapters of Miss Peck's book are of this character. Chapters V and VI, which give an account of the attempt to ascend Mount Illampu (Sorata), Chapter VIII, Arequipa and El Miste, Chapter XIII, another trial of Illampu, Chapters XV, XVI, XIX, XX, XXV, and XXVI with the various records of Huascarán, and Chapter XXIII, the account of the ascent of a smaller peak, comprise the entire account of the mountain work of the author in South America. The various expeditions were made under the most trying circumstances, and great persistence was shown by Miss Peck in pushing her expeditions through to so complete a climax. In the first place, at no time did she have enough money for the work, and one can sympathize with her as, when speaking of the expedition sent from Paris to Peru to secure the altitude of Huascarán, she writes that "$13,000 seems a large sum to spend for the triangulation of a single mountain which it cost but $3,000 to climb. With $1,000 more for my expedition, I should have been able with an assistant to triangulate the peak myself." Then the native porters always failed her at the crucial moments, but as this is usual such a failure can be guarded against provided the money is at hand. Again, the companions insisted on dictating the course of the party while on the mountains and Miss Peck was not able really to command any of her expeditions. The book is illustrated by many pictures, covering all phases of her itinerary.

R. M. BROWN.

* Listed under "Peru-Bolivia, etc." on p. 317.

Los Aborígenes de la República Argentina. Manual adaptado á los programas de las Escuelas Primarias, Colegios Nacionales y Escuelas Normales. Por Félix F. Outes y Carlos Bruch. 149 pp. Maps,* ills., index. Ángel Estrada y Cía, Editores, Buenos Aires. 1910. 8 x 5½.

This small volume, prepared for use in the higher schools and colleges of Argentina, gives a fairly comprehensive survey of the evolution of life in the republic. One third of the book is devoted to general notes on the larger geologic and palæontologic features of the country. These notes lead up to a short discussion of prehistoric man in Argentina. The occurrences of fossil human skulls, in the Pampean, and abundant palæolithic implements, in many localities, are the evidences of man's antiquity in that part of the world.

The remainder of the book covers the groups of aborigines in historic times. Six groups are recognized: (1) in the mountains of the northwest; (2) in the forests of the Gran Chaco; (3) in the littoral of the great rivers (the Argentine mesopotamia); (4) in the pampas proper; (5) in Patagonia; and (6) in the archipelago south of the Straits of Magellan.

A systematic discussion of each group is given according to a rather rigid plan, as follows: the areal distribution of the group; physiography of their habitat; physical characteristics of the people; language and symbology; food, habitations, dress, and occupations; sports and festivals; religious beliefs, marriage and funeral rites; social organization; relations to other tribes; barter and transportation. A map showing distribution, many illustrations of implements, customs, etc., and a bibliography supplement the text for each group.

The treatment of so many topics in such small space makes each topic necessarily very brief—not infrequently only a line or two. Yet in spite of this brevity a good many striking contrasts are found when the life of one group is compared with another. Many of these contrasts can be traced readily to differences in the physical aspects of the region. WALTER S. TOWER.

AFRICA

The Suk: Their Language and Folklore. By Mervyn W. H. Beech. With an Introduction by Sir Charles Eliot. xxiv and 151 pp. Maps,† ills. and appendix. Clarendon Press, Oxford, 1911. 9 x 6.

The linguistic and ethnographic material presented entertainingly in this brief volume should go far toward the solution of several problems of inner Africa. Mr. Beech has not only identified the Suk with the better-known stock of the Masai through their Nandi connections, but the careful detail which he offers may be expected to broaden our knowledge of the Masai themselves. In one rather important particular this study is unique in ethnography. We have no small number of instances in which human societies are known to have changed their environment and consequently their habit of life, but we lack the record of the period in which the change is operative. Mr. Beech makes it clear that the Suk are found in this rare stage of flux. In origin they are fugitives, sad remnants of war who have found a lonely refuge in the readily defensible gully lands of the Elgeyo escarpment. In this condition of safety and seclusion the Suk have progressed to an agricultural development. With accretion of numbers as an internal result of the fastness security and also in continuance of the external refugee system the Suk have become sufficiently

* Listed under "Argentina," on p. 317.

† Listed under "British East Africa" in *Bull.* Vol. 44, No. 1, Jan., 1912, p. 78.

strong to advance upon the plains. Here they have become a pastoral people, nomadic within safe limits which yet are sufficiently extended to cancel whatever idea of house and home has been reached in their agricultural stage. This change of habitat affords opportunity for a study of cultural modification as interesting as it is rare under actual observation. The student of speech in Africa will welcome the minute grammatical record presented in this volume, and the copious vocabulary will fit into its place in the examination of the Masai-Nandi group. WILLIAM CHURCHILL.

Ethnology of A-Kamba and Other East African Tribes. By C. W. Hobley. xvi and 172 pp. 54 ills., map, appendix and index. University Press, Cambridge, 1910. $2.50. 8½ x 5½.

The A-Kamba tribe inhabits the country between the mountains of Kenia and Kilimanjaro in British East Africa. The characteristics of these people form the theme of most of this book. Brief notes on other tribes, as the Masai, the A-Kikuyu, the Mogogodo and the Mweru, conclude the volume.

The description of the A-Kamba and their customs is most carefully and interestingly written. From the standpoint of the anthropologist the author says that the points of greatest interest are the circumcision ceremonies and in connection with them the carvings of pictographic riddles on the Musai sticks. A chapter describes the baskets, metal work, pottery, house building, native beer, musical instruments, bee-keeping and stool manufacturing. This chapter and many others are rich in sketches. Among the notes on other tribes is a chapter on the "Early Colonization of British East African Highlands," which discusses the distribution of the aborigines and the invasions and accidents which finally scattered them. R. M. BROWN.

The Climate of the Continent of Africa. By Alexander Knox. xii and 552 pp. Maps,* index. University Press, Cambridge. 1911. $7. 9½ x 6½.

Information regarding African climates has been accumulating so rapidly in recent years, and is scattered through so wide a range of publications, that it is a satisfaction to have Mr. Knox's summary. The author has read extensively all available reports, official and unofficial, and acknowledges the sources of his information with complete and refreshing frankness. In the words of the Preface, the volume "represents an endeavor to place before those who require it such accurate information concerning the climate of Africa as is available." We cannot, however, in any way reconcile ourselves to the fact that Mr. Knox has nowhere mentioned Hann, or Hann's admirable and unusually thorough discussion of the climates of Africa in the third edition of the famous "Handbuch der Klimatologie."

The rainfall maps,* one for each month and one for the year, are, with the exception of those for extreme southern Africa, new compilations and are therefore the most important part of the book. Ten-year rainfall records are taken as the basis of the maps, the shorter period stations receiving less weight in drawing the isohyetal lines. There has been such a rapid increase in the number of rainfall stations in Africa of late years that Mr. Knox has done a welcome piece of work in bringing the newer records together. These rainfall maps are first discussed, after which the general climatic conditions of the whole continent are considered month by month, thus giving a broad view which many who cannot take time to read the whole book will find useful.

* Listed under "Africa" on p. 317.

The various countries, colonies and protectorates are then treated in detail, grouped into four divisions. Productions are briefly described. Liberal quotations from personal accounts of climate and weather give these descriptions local color, and make them vivid. Frequent reference is made to the suitability of the climates for European residence, and while these statements are naturally rather indefinite, there is often an emphatic statement, as, *e. g.*, on page 179, "On the Ivory Coast no European should prolong his first stay over 18 months, and subsequent periods of residence should be limited to 15 months, with breaks of 5 or 6 months for return to Europe." Clothing and food also receive attention. For each section, or group of sections, selected climatic data are given in tabular form.

We regret that the rainfall maps are, with the exception of the mean annual, placed in a pocket instead of being bound in with the text. R. DEC. WARD.

ASIA

The Full Recognition of Japan. Being a Detailed Account of the Economic Progress of the Japanese Empire to 1911. By Robert P. Porter. xii and 789 pp. 7 maps* and index. Henry Frowde, Oxford University Press, New York, 1911. $4. 9 x 6½.

Conclusions are a matter of interpretation; each interpreter has full right to draw his own, but Mr. Porter has the skill to mass facts into a convincing body of proof. Furthermore, he presents impartially the facts which he has amassed for his proof. In this regard the work will long stand as a magazine of the material necessary for the comprehension of the civic movement in Japan which must attract wide interest. The work is excellently balanced in all its parts, each a satisfactory essay on some salient feature of the economic or artistic life of the Island Empire, a division which fortunately is less strongly marked in that life than in ours; each of the chapters fits into its proper place in the presentation of so much of the old as is needful for the comprehension of the new and of so much of the sense underlying the new as is needful for intelligent comprehension of Oriental progress on lines derived from the Occident. How far this new progress is but imitative, how far it represents the adjustment of that which has been found of value in one civilization to the diverse needs of another civilization, that is a question which Mr. Porter can answer no more satisfactorily than others who have preceded him. Pierre Loti has recorded one Japan, Lafcadio Hearn has recorded another; no critic may reconcile the rival claims and determine which, or neither, is the true Japan.

It tends toward accuracy to present tables of figures and to set consonant tables together for comparison. So far as these facts are really facts they are here set down for reference; no work contains so many and of course no work contains them brought so closely to the current dates. It is upon this statistical side that the author has spent most of his effort. Art, music, literature are scarcely to be presented in tabular form. These chapters,. accordingly, free from massed figures and treated with much freer hand, are more distinctly the record of personal impression; therefore they run more smoothly and produce a better effect. The whole theme of the work is the chronicling of change in Japan and the comprehension of its method and incidents. Mr. Porter has been able to witness change within the period of his own acquaintance with Japan; therefore he has, in his own experience, a comprehension of alterations which

* Listed under "Japanese Empire" on p. 318 and under "World and Larger Parts" on p. 320.

have come to pass with himself as witness, and this gives him in large measure the mental attitude for the reading of the record of more extended change.

WILLIAM CHURCHILL.

Life in the Moslem East. By Pierre Ponafidine. Translated from the Russian by Emma Cochrane Ponafidine. xiii and 429 pp. Ills. Dodd, Mead & Co., New York, 1911. 9½ x 6½.

Consul-General Ponafidine's work is not a political memoir, indeed he is sedulous to avoid the slightest revelation of the policy which he so successfully administered. Just by reason of this reserve, of this very careful hiding, the work is all the more valuable as a contribution toward our knowledge of what Russia is doing in that vast area of central Asia whence in the past have swept over and over again waves of crude barbaric might upsetting high civilizations. The barbarian of the central desert is still at the Chinese Wall, still does he hover at India's scientific frontier. But in these later days at the back of the barbarian stands Russia. From the Gate of the Caucasus to the Gate of the East, the Russian is popular and the Briton is unpopular. After conquest each is busy in the task of administration; the British tax is scientifically adjusted and it galls, the Russian impost is everything that is uneconomical and it is paid with a smile. The author does not reveal why this is so, but there are unstudied revelations, and these are all the more valuable. The keynote of the greater Russian policy is sympathy. It may be at times an amused tolerance, but it is always sympathetic.

Other works are readily accessible which cover the field of this work. We have more minute studies of Persia; in greater detail we may readily find the story of the sacred pilgrimage to Mecca; there is store of critical study of India. But not in one nor in all is there to be found the elucidation which this volume sheds upon Russia in Asia. It is a very human problem and calls for human sympathy. Russia in Asia is but the sum and congeries of the Russian in Asia. The author's record of the life and the alien culture with which he has had to deal is intimate and appreciative. He sets forth a record of the turmoil and the calm of the East which is charged with sympathy whether he is dealing with the crudity of those days at Mecca about the Kaaba or the gentle violence of the worshippers of Bowani, the latter so little comprehended by the British that in our speech their name of Thug has become typical of the rude violence which was essentially not their method. Read with this understanding in the reader's mind, the work should prove a contribution of rare value to our knowledge of the great drama which is working out in mid-Asia. WILLIAM CHURCHILL.

Meine Vorderasienexpedition 1906 und 1907. Band I, Erster Teil. Die fachwissenschaftlichen Ergebnisse. Von Hugo Grothe. Mit Beiträgen von Prof. Dr. Broili, Dr. J. Oehler, Dr. T. Menzel, Hofrat Prof. Dr. J. Strzygowski, und Prof. Dr. L. Curtius. xvi+cclxxxxv pp. 162 ills., 2 plans and 1 map.* Verlag von Karl W. Hiersemann, Leipzig, 1911. M. 28. 10 x 7½.

Four years have elapsed since the completion of the author's exploration of the Antitaurus in particular and of Cappadocia in general, and now we begin to have the results. Grothe was busy in the field for a year and a half, finishing on the last day of 1907. In this volume we find nine essays dealing with specific detail of the geography of the expedition or with specific collections made in connection therewith. Four of these essays are by Dr. Grothe. The

* Listed under "Turkey in Asia" on p. 318.

other five are by Broili of Munich on the geological and paleontological results, by Oehler of Vienna on the Greek and Roman epigraphy of Cappadocia, by Menzel of Odessa—by far the largest essay in the volume—on the Jezidae or devil worshipers, including translations and critical commentary of the Turkish text of Mustafa Nuri Pasha, by Strzygowski of Vienna on the art remains at Comana, Masylyk and Kaissari, and by Curtius of Erlangen on the minor artifacts gathered from the ruins under examination. These will appeal each in its own field to the several specialists.

We find a wider appeal in the geographical results which are included in the essays by Dr. Grothe. He is not yet ready to present the narrative of his long and sedulous exploration in this interesting field which has long been neglected. Where these essays will adjust themselves to the work in its entirety must be determined in the future. For the present he gives us brief reports on the ruins of Masylyk which seems abundantly identified with the Augusta of Ptolemy, on the topography and historical geography of Comana Cappadociae, and notes of peculiar value upon the Hittite memorials which he found in his travels and several of which he brought to light. The illustrations are excellent, the epigraphic material thus presented will be found of great value in the study of this type of palæography.

His map of the Antitaurus whets our appetite for the more generally geographical reports of the expedition. In this he has covered the area between 36°–37° E. Long. and 38°–38°45′ N. Lat. In this area the red lines of his route show how deeply he has penetrated into mountain valleys, how keen he has been to break away from trodden paths and investigate the wilder regions. The result is shown in a brilliant series of observed contours which will go far to set forth the intricacy of these mountains which have preserved no less than four culture societies far into the periods of their successors.

WILLIAM CHURCHILL.

Burma: A Handbook of Practical Information. By Sir J. George Scott. x and 520 pp. Map,* ills. and index. Alexander Moring, Ltd., London, 1911. 10s 6d. 7½ x 5.

Though announced as a new and revised edition, it is more correct to describe this as a reprinting of a volume whose value has brought recognition as the standard authority upon that great region which used to be known as Farther India. The revision is comprehended in a page of errata to be corrected and in the rewriting of the appendix chapter on the Shan States to conform with the richer knowledge which has become available in the five years since the Handbook was first given to the press. It might prove difficult to assign too high a degree of praise to this work, a model of all that a compendium of the life and history of a people should be. It carries, and presents in an orderly arrangement, all the information for which the investigator would naturally consult its pages. It passes far beyond these limits, it is instinct with that sympathetic appreciation of the traits of the people of his charge which has set Sir James George Scott in the list of the great British proconsuls and which we have learned to esteem when he writes of the Burman under the thin veil of his pen name Shway Yoe. Those who have found it impossible to acquire the first edition of the Handbook will count it no hardship to take pen to make the corrections indicated on the errata table and thus to make the revision revised indeed.

WILLIAM CHURCHILL.

* Listed under "British India," *Bull.*, Vol. 44, No. 1, Jan., 1912, p. 79.

Nord-Sumatra. Bericht über eine im Auftrage der Humboldt-Stiftung der Königlich Preussischen Akademie der Wissenschaften zu Berlin in den Jahren 1904–1906 ausgeführte Forschungsreise. Von Prof. Dr. Wilhelm Volz. Band II: Die Gajoländer. xix and 428 pp. Ills., maps,* index. Dietrich Reimer (E. Vohsen), Berlin. 1912. 18 M. 10 x 7.

Just a year ago we reviewed the first volume of this truly brilliant work of geographical and geological exploration.† This second volume most fitly completes the work, a tribute worthy of that great Humboldt in whose honor it is added to the store of our knowledge. Following the excellent method outlined in the former volume Prof. Volz has here entered upon ground still less known. The Gajo, or Gaju—for we lack present authority for a standard in the multiplicity of forest dialects—are the mountain folk of the extreme north of Sumatra, hemmed in along the coast line by a belt of those Atjeh with whom the government of Netherlands-India has waged uneven but unsuccessful war for generations. Organized military forces rarely come out of the bush fighting with flying colors, and the war with the Atjeh has taught the Netherlands full sympathy with Braddock's red column in the mountains of Pennsylvania. Because of this war Prof. Volz needed a column of soldiers, fortunately only as a precautionary measure and to secure him unimpeded access to the mountain lands, for once well within the terrain which he had set before his efforts the peaceful pursuit of his exploration was not interrupted.

The cartographic results of this survey cover a large part of an area almost amounting to four square degrees, the least known part of the great island. Within this area the names of mountains and streams, of settlements and provinces have been carefully ascertained and accurately recorded. The topographical map* indicates relief by contours and 'layer' coloring; the geological map* distinguishes six formational and six petrographic divisions. These maps show the geographical coördinates, the omission of which, in the maps of the former volume, was a matter for comment.

We now have the completion of a work which is typical of the combination of brilliancy in discussion with painful accuracy in gathering the material for such discussion, which represents the attainment of the trained German geographer. The region which in these two volumes has intimately been made known to us is not too extended for study by a solitary explorer, yet in none of the themes which must engage his attention is it so lacking in distinction as to lead to monotony. Professor Volz would be the first to deprecate the suggestion that his work is exhaustive and definitive. Not for long years of extending settlement will it be possible to speak the last word of discovery in such a land as the wilds of northern Sumatra. But he has produced a work which must serve as the foundation for all the study of this most interesting region which the future will afford. WILLIAM CHURCHILL.

The Emir of Bokhara and his Country. Journeys and Studies in Bokhara (with a chapter on my voyage on the Amu Darya to Khiva). By Ole Olufsen. ix and 599 pp. Map,‡ ills., bibliography, index. William Heinemann, London. 1911. 10 x 7½.

The book contains an exhaustive and well-balanced account of Bokhara based on observations during two journeys. The country is described under

* Listed under "Sumatra" on p. 318. † *Bull.*, Vol. 43, 1911, pp. 377–378.
‡ Listed under "Bokhara" in *Bull*, Vol. 44, No. 2, Feb. 1912, p. 157.

three headings, Mountain Bokhara, Steppe Bokhara and Desert Bokhara. The style is in part descriptive and in part narrative. The chapters on the desert and the mountain areas give in some detail a description of the country which, because of the omission of a generalized view at the outset into which the details may be fitted, is difficult reading, and one is glad when the author begins again to narrate the events of one of his excursions, which at least yields an inductive study even though the items are numerous. In addition to the chapters mentioned, there are valuable accounts of the climate, the vegetation and animals, the inhabitants, diseases and all the facts in the life of the community with which the anthropologist deals. The chapter on climate, taken in connection with that on disease, is especially interesting. R. M. BROWN.

EUROPE

Die Slaven. Ein Urvolk Europas. Von Martin Zunkovič. Sechste Ausgabe. viii and 373 pp. Map,* ills. and index. In Kommission bei der k. k. Universitäts-Buchhandlung Georg Szelinski, Vienna, 1911. 9½ x 6½.

We may not properly engage here upon the discussion of the philological problems set before us in this volume nor upon the particulars of Indo-European origin which are considered by the author from his particular point of view, one which, we must note, is intensely national. We observe that, in the course of repeated publication, this work has come to a new title, to a more positive statement. For its first four editions it was entitled "Wann wurde Mitteleuropa von den Slaven besiedelt?"; in this and the preceding fifth edition Mr. Zunkovič states the positive conclusion that the Slavs beyond all doubt are the original inhabitants of Europe and that no migration brought them thither. This is a highly particular field of inquiry, one with which geography can concern itself only when the special students have fought out their own battles and have agreed upon some results which will be generally acceptable.

The most interesting detail of this work is the employment which the author makes of geography to establish his contentions, remembering always that he is engaged in a field of the hottest controversy. He premises there can be no history of ancient Europe, the Europe of the aurochs and the period of the ice recession, there can be no light in antiquity so long as men are willing to "blot out the light with paper dogmas, with empty citations and phrases." The light of antiquity lies for him in the ancient names of the landscape; every brook and every hill, alp and lower meadow, farmstead and pasture land, so long as they are known by any name at all, reveal to his research this mysterious past. From Nijni-Novgorod to Normandy he reads the place names of Europe into Slavic roots and thus establishes the antiquity of his race. Geography has had contests of its own; it is restful to see geographical material cast into the polemics of a sister science and to sit back in the position of non-combatants awaiting the issue. WILLIAM CHURCHILL.

PHYSICAL GEOGRAPHY

Weather Science. An Elementary Introduction to Meteorology. By F. W. Henkel. 336 pp. Ills., index. T. Fisher Unwin, London. 1911. 6s. 8 x 5½.

We suppose that many persons may gain a real interest in meteorology through a perusual of "Weather Science," for there is much in the book which

* Listed under "Hungary" on p. 319.

would appeal to an average and casual reader. But beyond that general statement of the place which this volume may, perhaps, fill we hardly care to go. Mr. Henkel writes like a lover of the science who, in an amateurish sort of way, has read a few meteorological text-books and journals, and has put down, without much attempt at order or system, some rather rambling comments on meteorological subjects. The arrangement of the chapters is singularly illogical. There is very frequent repetition throughout the book, and in some cases the repetition brings contradiction, or at least disagreement, between the earlier and later statements. The book is full of inaccuracies and errors, and is often far behind the times. Howard's cloud nomenclature is given, but there is not a word about the standard International Classification. Mixture is evidently regarded by the author as an effective cause of condensation, and he also still clings to that unfortunate idea that the cooling "by contact with the hill tops" is the principal cause of heavy rainfall in mountainous regions. We confess that we do not know what is meant (p. 101) by "the descent of the return trades brings abundance of rain," nor (p. 106) by "tropical cyclones causing storms." Some of the residents in Utah would probably resent the statement that the Salt Lake district is the driest region in the United States. And that "every cloud is the visible top of a column of invisible water vapor," while it has some grain of truth hidden away in it, is a statement which ought to be combated by many school children. We cannot help wondering who (p. 120) "Professor Reye of America" may have been. There is a singular fatality about the letter *s* in the spelling of Buy Ballot (p. 150), Glaishers (p. 155) and Alacka (p. 192). We are not in the habit of using "barber" for blizzard in this country, nor of thinking that ocean currents are due primarily to differences of specific gravity (p. 196).

There are a few illustrations, mostly of instruments, and only two charts, of small size. We are glad, however, to call attention to the excellent cloud picture which forms the frontispiece—a most artistic view—and to the photograph reproduced opposite p. 140, showing the funnel and masts of a steamer whose hull is hidden in the fog (not a "ground fog" as the legend underneath asserts). Both of these pictures were taken by Captain Wilson Barker.

R. DEC. WARD.

OTHER BOOKS RECEIVED

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These notes do not preclude more extended reference later

IMMIGRANT RACES IN NORTH AMERICA. By Peter Roberts. 109 pp. Maps, ills. Young Men's Christian Ass'n. Press, New York. 1910. 50 cents. 8 x 5½.

GOOD ROADS PARTY. From States of Arkansas, Oklahoma, Lousiana, Texas. On Tour of Inspection through Eastern States. 148 pp. Ills., index. 1909. [Contrasts road-building here and abroad; describes road-building in New Jersey, New Hampshire, Massachusetts, Rhode Island, Connecticut and New York and gives a condensed history of road-making, road-legislation, etc.]

GUIDA DEGLI STATI UNITI PER L'IMMIGRANTE ITALIANO. Pubblicata a cura della Societa delle Figlie della Rivoluzione Americana, Sezione di Connecticut. By John Foster Carr. 85 pp. Map, ills. Doubleday, Page & Co., New York., 1910. 15 cents. 7½ x 5. [A useful guide for Italian peasants arriving in this country; with many suggestions as to their procedure from the time of their arrival, societies and schools designed to help them, distribution of their countrymen in various states, etc.]

A GUIDEBOOK TO COLORADO. By Eugene Parsons. xxxii and 390 pp. Maps, ills., index. Little, Brown & Co., Boston. 1911. 7½ x 5. [Describes the State by counties. This plan may be useful to those who are visiting or investigating special localities, but it does not admit of an orderly treatment of aspects which appeal most to the tourist. Nothing is omitted, however, that may interest either the traveller or the intending settler.]

PLACE-NAMES IN QUEBEC. By James White. Part II: Ninth Report of the Geographic Board of Canada, 1910. Sessional Paper No. 21a, pp. 153-455. Maps. [Gives the origin of many place names, lists of expeditions and explorers in Northern Canada (1576-1910) and bibliography of principal works consulted in preparing the volume.]

EXPLORATION OF CERTAIN IRON-ORE AND COAL DEPOSITS in the State of Oaxaca, Mexico. By J. L. W. Birkinbine. Maps, ills. Transactions of the American Institute of Mining Engineers, pp. 671-693. [A paper read before the American Institute of Mining Engineers, at the Pittsburg Meeting, March, 1910.]

CUBA AND HER PEOPLE OF TO-DAY. An account of the history and progress of the island previous to its independence; a description of its physical features; a study of its people; and, in particular, an examination of its present political conditions, its industries, natural resources, and prospects; together with information and suggestions designed to aid the prospective investor or settler. By Forbes Lindsay. xii and 329 pp. Map, ills., index, appendices. L. C. Page & Co., Boston, 1911. 8 x 5½.

DER PANAMAKANAL. Die Bedeutung des Kanalbaues, seine Technik und Wirtschaft. Von Max D. Fiegel. vii and 183 pp. Map, ills. Dietrich Reimer (Ernst Vohsen). Berlin, 1911. M. 4. 9 x 6. [Treats of the plan of the canal, methods, labor and machinery used, the government of the Canal Zone, and the importance of the canal in relation to many countries and ports. One of the best books on the subject.]

SOUTH AMERICA

DIE ENTWICKELUNG DER FABRIKINDUSTRIE IN LATEINISCHEN AMERIKA. Von Frhr. von Gemmingen. Angewandte Geographie, III. Serie, 10. Heft. 198 pp. Gebauer-Schwetschke Druckerei, Halle a. S. 1910. Mk. 4. 8½ x 6. [As comparatively little has been written on the present status of the industrial development of Latin American countries, this careful study is especially timely. The larger attention is naturally given to Argentina, where the greatest advance in manufacturing has been made.]

MONOGRAFÍA DE LA INDUSTRIA DE LA GOMA ELÁSTICA EN BOLIVIA. Por Manuel V. Ballivián y Casto F. Pinilla. v and 354 and lxxxiv pp. Map. Dirección General de Estadistica y Estudios Geográficos, Bolivia. 1912.

COMPENDIO DE COROGRAPHIA DO BRASIL de Accôrdo com o Programma do Gymnasio Nacional. Pelo Dr. Feliciano Pinheiro Bittencourt. Second edition, revised and augmented. 381 and viii pp. Maps, ills. Francisco Alves, Rio de Janeiro. 1910. 7 x 5. [A good, condensed treatment of the geography and activities of Brazil modeled on recent French school geographies.]

FLORA DER UMGEBUNG DER STADT SÃO PAULO IN BRASILIEN. Von Dr. A. Usteri. 271 pp. Map, ills., index. Gustav Fischer, Jena, 1911. Mk. 7. 10 x 6½. [A thorough study of the flora in the neighborhood of the city of São Paulo with discussion of the plants peculiar to the dry lands and the swamps; also a list of the plants (155 pp.) with description in Latin of each variety.]

LES FRANÇAIS AU BRÉSIL ET EN FLORIDE (1530-1568). Par Eugène Guénin. Premiers essais de colonisation. 100 pp. Eugène Bigot, Paris. 1910. Fr. 2.50. 7½ x 5.

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IN AFRICA (LETTERE DALL' ERITREA). Di Giotto Dainelli. Parte Prima: Lungo l'Anseba e sull'altipiano abissino. 184 pp. Maps, ills. Parte Seconda: Lungo le pendici dell'altipiano abissino e in Dancalia. 201 pp. Maps, ills. Serie Viaggi. Istituto Italiano d'Arti Grafiche-Editore, Bergamo. 1910. L6.50 each. 10½ x 7½ each. [Good geographical descriptions and superior maps and photo-engravings.]

HAUSA SAYINGS AND FOLK-LORE WITH A VOCABULARY OF NEW WORDS. Compiled and edited by Roland S. Fletcher. 173 pp. Oxford University Press, New York. 1912. 3s 6d. 7½ x 5.

ORIENTAL CAIRO. The City of the "Arabian Nights." By Douglas Sladen. xvi and 391 pp. Map, ills., index, appendices. J. B. Lippincott Co., Philadelphia, 1911. $5. 9 x 6½. [This book is to be commended to the public and especially to those who expect to visit Cairo.]

NORD-TOGO UND SEINE WESTLICHE NACHBARSCHAFT. In Bildern und Skizzen für Missions und Kolonialfreunde. Von R. Fisch. 189 pp. Map, ills. Basler Missionsbuchhandlung, Basel. 1911. 40c. 7½ x 5. [Informing descriptions of North Togo based on missionary journeys in 1910.]

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BEITRÄGE ZUR GEOLOGIE OST-ASIENS UND AUSTRALIENS. Mit Unterstützung des Niederländischen Ministeriums der Colonien. Herausgegeben von K. Martin. Sammlungen des Geol. Reichsmuseums in Leiden. 107 pp. Ills. E. J. Brill, Leiden. 1911. Mk. 9.50. 9½ x 6½.

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AUSTRALASIA AND OCEANIA

AUSTRALIEN UND NEUSEELAND, Land. Leute und Wirtschaft. Von Dr. Robert Schachner. Aus Natur und Geisteswelt. viii and 120 pp. Maps, ills. B. G. Teubner, Leipzig, 1912. Mk. 1.25. 7½ x 5. [An admirable and comprehensive though condensed study of Australia and New Zealand.]

OFFICIAL YEAR BOOK OF THE COMMONWEALTH OF AUSTRALIA. Containing Authoritative Statistics for the Period 1901-1910 and Corrected Statistics for the Period 1788 to 1900. No. 4. 1911. By G. H. Knibbs. xxvii and 1230 pp. Maps, index. Commonwealth Bureau of Census and Statistics. Melbourne.

THE ROMANCE OF AUSTRALIA, Its Discovery and Colonisation. Adventures of its Explorers and Settlers. Edited by Herbert Strang. xi and 640 pp. Ills. Hodder & Stoughton, London, 1911. 6s. 8½ x 6.

NEW ZEALAND. By Sir Robert Stout and J. Logan Stout. 185 pp. Ills., index. University Press, Cambridge. 1911. G. P. Putnam's Sons, New York. 40 cents. 6½ x 5. [Tells briefly what New Zealand is and what has been done by her people.]

DE REIS VAN MR. JACOB ROGGEVEEN TER ONTDEKKING VAN HET ZUIDLAND (1721-1722) verzameling van stukken, deze reis en de daaraan voorafgaande ontdekkingsplannen van Arend Roggeveen (1675-1676) betreffende, uitgegeven door F. E. Baron Mulert. xxvii and 331 pp. Maps, ills. Linschoten Vereeniging. 1911. Martinus Nijhoff, The Hague. 10 x 7.

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MEDIEVAL EUROPE. By H. W. C. Davis. Home University Library. 256 pp. Map. Henry Holt & Co., New York. 1911. 7 x 5. [Among the best works in this handy volume series.]

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VERGLEICHENDE UNTERSUCHUNGEN über die Vegetationsformationen des innerea Nordwestdeutschland, insbesondere die der Floren von Hannover, Göttingen und Ober-Harz. Inaugural-Dissertation. Von Paul Thormeyer. 123 pp. Göttingen, 1910.

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A HISTORY OF TENNESSEE. From 1663 to 1911. For use in Schools. By G. R. McGee. 302 pp. ills., appendix, index. American Book Company, New York. 1911. 75 cents. 7½ x 5½.

EUROPE, A SUPPLEMENTARY GEOGRAPHY. By James F. Chamberlain and Arthur H. Chamberlain. (The Continents and Their People). ix and 258 pp. Ills. index. The Macmillan Co., New York. 1912. 55 cents. 7½ x 5.

L'EUROPE, LA FRANCE. Par F. Schrader et L. Gallouédec. 2e Année. 440 pp. Maps, ills. Hachette et Cie, Paris. 1911. Fr. 3.50. 7½ x 5. [Designed especially for normal schools. The second half of the book is given to France. Written on the same plan as the "Cours de Géographie" published by Hachette & Co., one of the best series of geographical text books in Europe.]

ELEMENTARY GEOGRAPHY. A Text-Book for Children. By Charles F. King. vi and 222 pp. Maps, ills., index. Charles Scribner's, New York. 1909. 10½ x 8½.

THE NEW OUTLOOK GEOGRAPHY. Book 1: How People Live. Part I.—The British Isles. Part II.—Outside the British Isles. By W. C. Brown and P. H. Johnson. 252 pp. Ills. 1s 6d. Book 2: The Home of Man. Part I.—The British Isles. By W. C. Brown and P. H. Johnson. 343 pp. Maps, ills,. index. 2s 6d. George G. Harrap & Co., London. 1911. 7½ x 5 each.

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THE OLD 'COUNTRY TRADE' OF THE EAST INDIES. By W. H. Coates. xiv and 205 pp. Map, ills. Imray, Laurie, Norie & Wilson, Ltd., London. 1911. 7½ x 5.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

System Followed in Listing Maps.

Title. As on original, if possible. If lacking or incomplete, necessary matter enclosed in brackets.

Scale. Natural (unless otherwise on original). If no scale on original, approximate scale enclosed in brackets.

Coordinates. Approximate limiting coordinates of map given. Where map-net lacking, coordinates, if possible of determination, given in brackets. All meridians referred to Greenwich. If map not oriented N., orientation given.

Colors. Number of tints of separate symbols, not number of color printings given. Black or basal color not considered a color.

Source. If map separately published, name of institution issuing it, place and date given. If a supplement, title of paper or book, author, periodical, volume, number, year and pages given.

Comment. Descriptive and critical. In brackets.

Regional Classification. Major political divisions the unit, as a rule, except for United States and Canada. Boundaries of continents according to Siever's *Länderkunde*, Kleine Ausgabe.

NORTH AMERICA

ALASKA. (a) Map of Hugh Miller Inlet. [1:250,000]. [58°48′ N. and 136°33′ W.].
(b) Map of Head of Reid Inlet. [1:253,440]. [58°56′ N. and 136°52′ W.].
(c) Map of Northern Part of Muir Inlet. [1:57,000] [58°50′ N. and 136°5′ W.].
Accompany, as Figs. XXIV, XXV and XXVI, "Revue de Glaciologie, No. 3" by C. Rabot, *Mém. de la Soc. fribourgeoise des Sci. Nat : Géol. et Géogr.*, Vol. 5, 1909.
[Reproduced from the report of the Harriman Alaska Expedition].

MEXICO. Sketch Map of the Sonoran Desert Region by I. N. Dracopoli, F.R.G.S. 1:1,041,860. 32°27′ - 30°30′ N.; 114°35′ - 110°52′ W. 3 colors.

NEWFOUNDLAND. (a) Map of Newfoundland from Rev. M. Harvey's Text Book of Newfoundland History (1890). [1:5,170,000]. 52°40′ - 46°0′ N.; 59°45′ - 52°30′ W.
(b) The Humber drainage. Reduced with some omissions from Howley's map of Newfoundland. [1:3,240,000], [50¼° - 48¾° N.; 59½° - 56° W.]. Oriented N.28° W.
Figs. 1 and 5, "Physiography of Newfoundland" by W. H. Twenhofel, *Amer. Journ. of Science*, Vol. 33, Jan. 1912, pp. 1–24.

UNITED STATES-MEXICO. (a) Suggested Line of Travel of Cabeza de Baca [Vaca]. [1:6,400,000]. 37° - 23° N.; 115° - 93° W. 1 color.
(b) Routes of Cabeza de Baca, 1536, Fr. Augustin Rodriguez, Francisco Chamuscado, 1581, Antonio de Espejo, 1582, Castaño de Sosa, 1590, Juan de Oñate, 1598. [1:7,000,000]. 34° - 25¾° N.; 107° - 100¾° W.
(c) Routes of the Coronado Expedition Specially Prepared under the Supervision of the Author [R. E. Twitchell]. [1:5,700,000]. 40° - 15° N.; 118° - 95° W. 1 color.
Accompany, facing p. 58, on p. 59, and facing p. 248, respectively, "The Leading Facts of New Mexican History," Vol. I, by R. E. Twitchell, Cedar Rapids, Ia., 1911.

UNITED STATES

NEW MEXICO. (a) Aboriginal Ruins near Sante Fé, N. M. [1:1410,000]. [36°0′ - 35°30′ N.; 106°30′ - 105°50′ W.].
(b) Marches by Coronado and captains in New Mexico, 1540–1541. [1:3,640,000]. [37°20′ - 33°5′ N.; 109°10′ - 102°50′ W.].
(c) New Mexico in the Seventeenth Century. [1:3,640,000]. [36°25′ - 33°56′ N.; 107°35′ - 105°3′ W.].
Accompany on pp 5, 167 and 188, respectively, "The Leading Facts of New Mexican History," Vol. I, by R. E. Twitchell, Cedar Rapids, Ia., 1911

NEW YORK. [Atlas of the counties of New York State, published by the Everts Publishing Co., Utica, N. Y. Title-page missing. With "Alphabetical Index to the Cities, Towns, Villages, Stations, etc., State of New York." Each plate separate and mounted on cloth. Price $34. Each plate is in four or five colors.]
[Plate] 8–9. Albany County [1:77,000]. 12–13. Allegany [1:100,000]. 16–17. Broome [1:94,000]. 20–21. Cattaraugus [1:117,000]. 24–25. Cayuga [1:104,000], with inset of northernmost township on same scale. 28–29. Chautauqua [1:112,000]. 32–33. Chemung [1:78,000]. 36–37. Chenango [1:103,000]. 40–41. Clinton [1:108,000]. 44–45. Columbia [1:86,000]. 48–49. Cortland [1:80,000]. 52–53. Delaware [1:133,000]. 56–57. Dutchess [1:100,000]. 60–61. Erie [1:110,000]. 64–65. Essex [1:158,000]. 68–69. Franklin [1:158,000]. 72–73. Fulton [1:86,000]. 76–77. Genesee [1:76,000]. 80–81. Greene [1:92,000]. 84–85. Hamilton [1:155,000]. 88–89. Herkimer [southern part] [1:96,000], with inset of northern part of Herkimer County [1:255,000]. 92–93. Jefferson [1:127,000]. 96–97. Lewis [1:125,000]. 100–101. Livingston [1:95,000]. 105–106 Madison [1:95,000]. 108–109. Monroe 1:87,000]. 112–113. Montgomery [1:85,000]. 116–117. Nassau [1:30,000]. 120–121. Greater New York City [1:102,020]. 124–125. Niagara [1:81,000]. 128–129. Oneida [1:127,000]. 132–133. Onondaga [1:96,000]. 137–138. Ontario [1:95,000]. 140–141. Orange [1:140,000]. 144–145. Orleans [1:78,000]. 148–149. Oswego [1:124,000]. 152–153. Otsego [1:124,000]. 156–157. (a) Putnam [1:87,000]; (b) Rockland [1:93,000]. 160–161. Rensselaer [1:86,000]. 164–165. Saratoga [1:101,000]. 168–169. (a) Schenectady [1:79,000]; (b) Schuyler [1:120,000]. 172–173. Schoharie [1:89,000]. 176–177. Seneca [1:80,000]. 180–181. Steuben [1:127,020]. 184–185. St. Lawrence [1:196,000]. 188–189. Suffolk [1:189,000]. 192–193. Sullivan [1:109,000]. 196–197. Tioga [1:80,000]. 200–201. Tompkins [1:80,000]. 204–205. Ulster [1:128,000]. 208–209. Warren [1:109,000]. 212–213. Washington [1:110,000], with inset of

northern part of Washington County on same scale. 217–218. Wayne [1:88,000]. 220–221. Westchester [1:80,000]. 224–225. Wyoming [1:79,000] 228–229. Yates [1:79,000].

[Maps of the usual type of county maps, compiled rather from the engineer's than from the geographer's point of view. Relief is not represented; occasional altitudes only are given Townships are distinguished by colors. There are separate symbols for: highways, improved highways, highways under contract for improvement, highways designated for future improvement and approved, steam railroads, electric railways, existing and proposed, school houses, elevations.

The linear element of the topography is of value for the regions of which no U. S. G. S. topographic sheets have been published. Otherwise the main value to the geographer of these and similar maps is the representation of property boundaries, of interest in tracing the history of settlement.]

SOUTH AMERICA

ARGENTINA. [Six maps of Argentina showing the habitat of its aborigines. (1:40,000,000). (21° - 56° S.; 76° - 50° W.):] (1) Mapa de la República, en el cual aparece . . , la región que ocuparon las tribus Diaguitas. (2)—la región ocupada por las tribus chaquenses. (3)—por los pueblos que vivieron ó aun viven en el litoral y proximidades de los grandes rios. (4)—por los pueblos de las llanuras. (5)—por las tribus Patagones. (6)—por los pueblos que habitan la parte argentina de los archipiélagos magallánicos. Accompany, as Figs. 13, 42, 64, 83, 106 and 129, "Los Aborígenes de la República Argentina" by F. F. Outes and C. Bruch, Buenos Aires, 1910.

BOLIVIA-BRAZIL-PERU. Les Explorations de 1910 dans la Bolivie Sept'le et le Matto Grosso. Expéditions du Major P. H. Fawcett, du Colonel Candido Rondons, du Dr. Th. Herzog, etc. 1:6,000,000. 8°14′ - 19°50′ S.; 70°45′ - 55°20′ W. 5 colors. Maps of America, No. 1, *l'Année Cartogr. 1910*, Oct. 1911.

[Incorporates the material of the authoritative map of South Peru and North Bolivia, 1:2,000,000, compiled at the suggestion of Sir Clements Markham by E. A. Reeves and published in the *Geogr. Journ.*, Vol. 36, Oct. 1910, (listed in the *Bull.* Vol. 42, 1910, p. 873).]

COLOMBIA-BRAZIL, ETC. (a) Le Rio Uaupes (Bassin Sept'al de l'Amazone) d'après le levé de Hamilton Rice appuyé sur des Observations astronomiques. 1:2,500,000. 2°29′ N. - 0°31′ S.; 72°35′ - 66°48′ W. 2 colors.

(b) Du Rio Negro à Bogotá. Itinéraire de Hamilton Rice. 1:10,000,000. 5°30′ N. - 0°45′ S.; 74¾° - 66° W. 3 colors.

Maps of America, Nos. 2 and [2a], *l'Année Cartogr. 1910*, Oct 1911.

PARAGUAY. Paraguay d'après la carte de Félix Ladouce dressée d'après les travaux personnels de l'auteur, sur les données astronomiques de F. de Azara, Toeppen, etc. 1910. 1:2,500,000. 21 4/5° - 27⅔° S.; 59° - 54° W. 5 colors. Maps of America, No. 3, *l'Année Cartogr. 1910*, Oct. 1911.

PERU-BOLIVIA, ETC. Map showing Huascarán and the Author's [Annie S. Peck's] Route. [1:7,000,000]. 8½° - 18° S.; 80° - 67°W. 1 color. Accompanies, facing p. 1, "A Search for the Apex of America" by A. S. Peck, New York, 1911.

[The map, in total disregard of the form used consistently in the text for the name of the mountain which constitutes the main theme of the book, and in spite of the special pains taken in the text to inculcate proper pronunciation (*e. g.*: Caribbean, p. 8; Panama, p. 9), places the accent of Mt. Huascarán on the penultimate.]

PERU-BRAZIL, ETC. Route Followed by the Author [H. J. Mozans]. [1:18,000,000]. [10° N. - 17° S.; 82° - 63½° W.] With an inset forming eastern continuation of main map: Eastern Part of Amazon River. Same scale as main map. [1° N. - 5° S.; 66° - 48° W.]. Accompanies, facing p. 1, "Following the Conquistadores: Along the Andes and Down the Amazon" by H. J. Mozans, New York and London, 1911.

AFRICA

AFRICA. [Thirteen rainfall maps of Africa. 1:40,000,000:] (1) Mean Annual. 9 colors. (2) January. (3) February. (4) March. (5) April. [The latter four maps in 6 colors]. (6) May. (7) June. (8) July. (9) August. (10) September. (11) October. (12) November. [The latter seven maps in 7 colors.] (13) December. 6 colors. Accompany, respectively as Pl. 1, facing p. 10, and as Pls. 2–13, in pocket, "The Climate of the Continent of Africa" by A. Knox, Cambridge, 1911.

[Valuable maps embodying new material except for the extreme south of the continent. Map (1) shows isohyets for 250, 500, 750, 1000, 1500, 2000, 3000 and 4000 millimeters. On the remaining maps the isohyets of 25, 50 100, 200, 300 and 400 millimeters are given. In this connection see also the map entitled "Jährliche Regenmengen auf dem Festlande von Afrika," 1:25,000,000, by G. Fraunberger, *Pet. Mitt.*, Vol. 52, 1906, Taf. 7, referred to by Mr. Knox in the discussion devoted to the above thirteen maps on pp. 1–13 of his book (cf. review, pp. 300–301).]

ANGLO-EGYPTIAN SUDAN. Kordofan d'après les travaux anglais les plus récents. 1:6,000,000. 16° - 9° N.; 26°47′ - 32°53′ E. 2 colors. Maps of Africa, No. 2, *l'Année Cartogr. 1910*, Oct. 1911.

BELGIAN CONGO-UGANDA-GERMAN EAST AFRICA. La frontière Germano-Belge dans l'Afrique Orientale. 1:3,000,000. 0° - 3°40′ S.; 27°47′ - 30°28′ E. Maps of Africa, No. 5, *l'Année Cartogr. 1910*, Oct. 1911.

[Boundaries according to the agreements of June 14 and Aug. 11, 1910.]

LIBERIA, ETC. (a) Liberia. Explorations de M.M. W. Volz et C. Braithwaite-Wallis. 1:1,750,000. 8°37′ - 7°40′ N.; 10°50′ - 9°5′ W. 4 colors.

(b) Liberia. Croquis montrant la frontière franco-libérienne. D'après les travaux de la Commission de Délimitation 1908–1909. 1:5,000,000. 8°55′ - 4°0′ N.; 12°7′ - 7°0′ W. 4 colors.

Maps of Africa, Nos. [4a] and 4, *l'Année Cartogr. 1910*, Oct. 1911.

NIGERIA-KAMERUN. Zone frontière Anglo-Allemande (Nigeria-Cameroun) entre la Rivière Cross et Yola. D'après les travaux de la Commission de Délimitation (1907–1909). 1:3,000,000. 9¼° - 5½° N.; 8°45′ - 12°27′ E. Oriented N. 16½° W. 2 colors. Maps of Africa, No. 3, *l'Année Cartogr. 1910*, Oct. 1911.

[Reduced from the map of the Nigeria-Cameroons Boundary Commission Survey, 1:1,000,000, published in the *Geogr. Journ.*, Vol. 36, Oct. 1910, and listed in the *Bull.*, Vol. 42, 1910, p. 874.]

NORTHERN NIGERIA. (a) [Three maps of Northern Nigeria, 1:8,000,000, limited by 14° - 6½° N. and 2° - 15° E., entitled:] (1) Primary Watersheds and River Systems. (2) Axes of Elevation. (3) Distribution of Salt, Tinstone, Gold and Galena.

(b) The Bauchi Plateau and the Nassarawa Tableland. 1:2,000,000. 10°30′ - 8°50′ N.; 7° - 10° E.
(c) Topographical and Geological Map of Northern Nigeria. 1:2,030,000. 14° - 7° N.; 3° - 14° E. 6 colors. With four geological sections.
Accompany, as Maps Nos. 1, 3, 4 and 2, and as separate map in pocket, respectively, "The Geology and Geography of Northern Nigeria" by J. D. Falconer, London, 1911.
[Map (c) a valuable fundamental map embodying the results of the Mineral Survey conducted by Dr. Falconer in 1904–09].

RHODESIA. North Eastern Rhodesia: Map Showing Native Tribes. [1:2,700,000. Scale incorrectly given as 31.6 miles=1 inch]. 8° - 16° S.; 27½° - 34½° E. 2 colors. Accompanies "The Great Northern Plateau of Rhodesia" by C. Gouldsbury and H. Sheane, London, 1911.
[Indicates the limits of the regions inhabited by the various tribes].

SAHARA. A travers le Sahara Central (d'In Salah au Niger par l'Ahaggar). Itinéraire levé par N. Villatte. Janvier-Novembre 1909. 1:4,500,000. 27°20′ - 15°10′ N.; 0° - 7½° E. 4 colors. Maps of Africa, No. 1, *l'Année Cartogr. 1910*, Oct. 1911.

TUNISIA-TRIPOLITANIA. Croquis de la Frontière Tuniso-Tripolitaine. [1:3,500,000]. 33°24′ - 30°5′ N; 8°52′ - 12°12′ E. Text map under 'Faits Politiques,' section devoted to Africa, *l'Année Cartogr. 1910*, Oct. 1911.

ASIA

ARABIA. Arabie (Asie en dix feuilles: Feuille V). 1911. 1:5,000,000. 34° - 12° N.; 33° – 62° E. 8 colors. Pl. 50, Atlas Universel de Géographie par Vivien de Saint-Martin et Fr. Schrader, Hachette & Cie., Paris.
[The relatively large scale of the map well brings out our lack of knowledge of the interior of Arabia. Accompanying list of sources dated Oct. 1911. Cf. below under 'China.']

ARABIA, ETC. Arabie du Nord Est. Itinéraires du Capitaine G. E. Leachman, 1910. 1:5,000,000. 33°50′ - 28°23′ N.; 42⅓° - 49° E. 4 colors. Maps of Asia, No. 5, *l'Année Cartogr. 1910*, Oct. 1911.

ASIA. Asia: Geographical Divisions. [1:50,000,000]. 8 colors. Frontispiece, "Europe (Blackie's Causal Geographies Regionally Treated)" by H. J. Snape, London, 1911.
[Valuable map of the structural divisions of Asia, mainly according to Suess, previously published as Pl. XIX of J. W. Gregory's "Geography: Structural, Physical and Comparative," 1908.]

CHINA. Chine (Asie en dix feuilles: Feuille VIII). 1911. 1:5,000,000. 41° - 20° N.; 100½ - 132 E. Plate 53, Atlas Universel de Géographie par Vivien de Saint-Martin et Fr. Schrader. Hachette & Cie., Paris.
[China on a larger scale than usually available in standard atlases. Accompanying lists of sources dated Dec. 1911. Cf. comment, *Bull.*, Vol. 43, 1911, p 552.]

CHINESE EMPIRE. (a) Turkestan Chinois et Kan-Sou. Itinéraires du Dr. M. Aurel Stein et de R. B. Lal Singh et R. S. Ram Singh, 1906-1908. 1:7,500,000. 43°45′ - 35°0′ N.; 74⅓° - 106° E. 5 colors.
(b) Partie Ouest du Turkestan Russe. Itenéraire de Mr. D. Carruthers, 1908. 1:5,000,000. 41½° - 40° N.; 72½° - 77½° E. 4 colors.
(c) Itinéraires de l'Expédition Kozloff en Mongolie et au Kan-Sou. 1:7,500,000. 48° - 34° N.; 99° - 108° E. 3 colors.
(d) Tibet Oriental et Chine Occidentale. 1:5,003,000 32° - 24° N.; 98° - 104⅔ E. 4 colors.
Maps of Asia, Nos. 1–4, *l'Année Cartogr. 1910*, Oct. 1911.
[Map (a) shows routes of Bacot (1909-10), Fergusson (1906–07-10) and Weiss]

FEDERATED MALAY STATES. Selangor, Federated Malay States. 1910. 2 Miles to an Inch (1:126,720). 3°55′ - 3°21′ N.; 100°45′ - 102°4′ E. 6 colors. In four sheets. Published by the Central Survey Office, Kuala Lumpur, F.M.S.
[Of the usual type of land survey maps; valuable because of its relatively large scale. Agricultural and mining "alienated" land, forest and other reserves shown. Relief indicated by approximate contours.]

JAPANESE EMPIRE. (a) Chosen (Korea) and Southern Manchuria. 1:4,000,000. 44 ⅗° - 33¾° N.; 120° - 133¾° E. 2 colors.
(b) Taiwan (Formosa). [1:2,100,000]. 25°18′ - 21°54′ N.; 119°27′ - 122°0′ E. 2 colors.
(c) [Two maps, viz.:] (1) The Japanese Empire. [1:12,300,000]. 51° - 20° N.; 117° - 157° E. 2 colors (2) Japan. 1:4,500,000. 46° - 31° N.; 128° - 146° E. 2 colors. With inset: Karafuto (Japanese Saghalien). [1:4,500,000]. 50½ - 45 5/6° N.; 141½° - 145½° E. 2 colors.
(d) [Two maps, viz.:] (1) Sketch Map of Japan: Administrative Divisions and Chief Railways. (2) Industrial Map of Japan. Both maps: 1:6,336,000. [42½° - 31° N.; 129° - 142° E.]. Oriented N. 42° E. 1 color.
Accompany: maps (a), (b) and (c) facing pp. 604, 654 and 778, respectively, and map (d) on rear inside cover, "The Full Recognition of Japan" by R. P. Porter, London, etc., 1911.
[Maps (a) and (b) show railroads, roads and lighthouses. Map (c1) shows chief railroads and steamship routes with approximate distances. Map (d2) gives value of output of each administrative division in thousands of pounds]

SUMATRA. (a) Karte der Gajo- und Alasländer nach den Beobachtungen von Prof. Dr. Wilhelm Volz und dem vorhandenen Material. 1:400,000. 5°0′ - 3°16′ N.; 96°36′ - 98°10′ E. 8 colors.
(b) Geologische Karte der Gajo- und Alasländer nach den Beobachtungen von Prof. Dr. Wilhelm Volz und dem vorhandenen Material. Same scale and coordinates as map (a). 14 colors
Accompany, as Karten 1 and 2 in pocket, "Nord Sumatra. Band II: Die Gajoländer" by W. Volz, Berlin, 1912.
[Highly important maps of regions practically unexplored hitherto, embodying the result of Prof. Volz's systematic explorations in 1904 to 1906. Map (a) a relief map with approximate contours of 200 meters interval and six color "layers"; route in red. Map (b) distinguishes between six formational and six petrographic divisions. Cf. review of book on p. 304.]

TURKEY IN ASIA. Karte des Antitaurus (auf Grund der Itineraraufnahmen vom 23. September 1906 bis 22. Januar 1907) von Hugo Grothe. 1:400,000. 38°43′ - 37°57′ N.; 35°49′ - 37°0′ E. 1 color. Accompanies "Meine Vorderasienexpedition 1905 und 1907: Band I, Erster Teil" by H. Grothe, Leipzig, 1911.
[Relief in approximate contours. Barometric altitudes given. Route in red.]

TURKEY IN ASIA. (a) Modern Palestine with Ancient Towns and Highways. [1:1,370,000]. 33°50′ - 31°0′ N.; 34°25′ - 36°50′ E. 8 colors.

(b) Photo Relief Map of Palestine by George Armstrong (of the Survey Party) . . . Published by the Palestine Exploration Fund, . . . London, 1905. [1:1,280,000]. [34° - 30½° N.; 33°50′ - 36°30′ E.].

Accompany, as frontispiece and facing p. 13, "Biblical Geography and History" by C. F. Kent, New York, 1911.

[Map (a) a physical map of Palestine. Although very fair for a wax-engraved map a comparison with the map of Palestine, listed below, accompanying Hölscher's book, brings out well the limitations of this method of reproduction.]

TURKEY IN ASIA. Palästina. 1:1,250.000. 33°53′ - 30°49′ N.; 34°13′ - 37°0′ E. 8 colors. With two insets: (1) Jerusalem (Kuds Esch-Scherif) 1:30,000 6 colors. (2) [The principality of] Lippe (52° N. and 9° E.) on same scale as main map for comparison. Accompanies "Landes- und Volkskunde Palästinas" by G. Hölscher, Leipzig, 1907.

[Excellent physical map of Palestine. Names given in a German transliteration of the Arabic. Typical of the high state of development of cartography in Germany, which makes it possible to publish so good a map as a supplement to a volume selling for 20 cents.]

EUROPE

BRITISH ISLES. (a) British Isles: Geographical Divisions. [1:5,300,000]. 60° - 49° N.; 11° W.-2° E. 4 colors.

(b) British Isles Showing the River Systems. Same scale and coordinates as map (a). 3 colors.

(c) Natural regions of Great Britain. [1:9,300,000]. [60° - 49° N.; 8° W. - 2° E.]

Accompany between pp. 46-47, 78-79 and on p. 80, respectively, "Europe (Blackie's Causal Geographies Regionally Treated)" by H. J. Snape, London, 1911.

[Maps (a) and (b) previously published as Pls. XII and XIV of J. W. Gregory's "Geography: Structural, Physical and Comparative", 1908. Map (b) distinguishes between consequent and subsequent rivers.]

FRANCE. (a) Carte du glacier des Sources de l'Arc (Maurienne) dressée par M. Paul Girardin. [1:70,000. Scale given as 1:60,000]. [45°25′ N. and 7°5′ E.].

(b) Carte des glaciers du Mulinet, du Grand Méan et des Évettes, dressée par M. Paul Girardin. [1:66,000]. [45°20′ N. and 7°5′ E.].

Accompany, as Figs. VIII and IX, "Revue de Glaciologie. No. 3" by C. Rabot, *Mém. de la Soc. fribourgeoise des Sci. Nat.: Géol. et Géogr.*, Vol. 5, 1909.

GERMANY. Die Mecklenburgische Schweiz (Malchin, Stavenhagen, Teterow, Dargun u. Anschluss). 1:100,000. [53°55′ - 53°35′ N.; 12°27′ - 13°0′ E.]. 4 colors. Compiled and engraved by: Geographisches Institut Paul Baron, Liegnitz i. Schl. Published by: Hothan'sche Buchhandlung, Malchin.

[Tourist map. Descriptive text on back.]

GREAT BRITAIN. (a) Physical Map of Berkshire. [1:400,000]. 51°49′ - 51°18′ N.; 1°41′ - 0°34′ W. 4 colors.

(b) Geological Map of Berkshire. Same scale and coordinates as map (a). 12 colors.

(c) England and Wales: Annual Rainfall. [1:6,000,000]. 56½° - 49° N.; 6° W. - 2° E.

Accompany, maps (a) and (b) on inside covers, and map (c) on p. 50, "Cambridge County Geographies: Berkshire" by H. W. Monckton, Cambridge, 1911.

HUNGARY. Genralkarte des Komitates Turócz Szt. Márton mit den Nachbargebieten. 1:200,000. [49°19′ - 48°38′ N.; 18°21′ - 19°10′ E.] 4 colors. Accompanies "Die Slaven: Ein Urvolk Europas" by M. Zunkovič, Vienna, 1911.

[Extract from the Austrian Generalkarte von Mitteleuropa on which are underlined all places the etymology of whose names indicates their origin as border posts and forts.]

ITALY. [Twelve sheets of the various editions of the map of Italy published by the Istituto Geografico Militare Florence, viz.:] (a) Carta d'Italia al 100,000 a tratteggio (price of each sheet L. 1.00). F[oglio 204: Lecce. 40°40′ - 40°20′ N.; 17°57′ - 18°27′ E. 1882 (Edizione 1905). Fo. 218: Isili. 40°0′ - 39°40′ N.; 8°57′ - 9°27′ E. 1911. Fo. 219: Lanusei. 40°0′ - 39°40′ N.; 9°27′ - 9°57′ E. 1911. Fo. 226: Mandas. 39°40′ - 39°20′ N.; 8°57′ - 9°27′ E. 1911 Fo. 235: Villasimius. 39°20′ - 39°0′ N.; 9°27′ - 9°57′ E. 1911.

(b) Carta d'Italia al 100,000 policroma senza sfumo. Fo. 171: Gaeta. 41°20′ - 41°0′ N.; 13°27 - 13°57′ E. 3 colors. 1910. Fo. 174: Ariano di Puglia. 41°20′ - 41°0′ N.; 14°57′ - 15°27′ E. 3 colors, 1910. Price L 0.40.

(c) Carta d'Italia al 100,000 policroma a sfumo. Fo. 171: Gaeta. Same coordinates as (b), Fo. 171. 5 colors. 1909. Fo. 174: Ariano di Puglia. Same coordinates as (b), Fo. 174. 5 colors. 1910. Price L. 1 00.

(d) Carta d'Italia al 200,000 a sfumo. Fo. 22: Argentera. 44°40′ - 44°0′ N.; 5°57′ - 6°57′ E. 7 colors. 1910. Price L 1.50. Fo. 23: Cuneo. 44°40′ - 44°0′ N.; 6°57′ - 7°57′ E. 7 colors. 1910. Price L. 1.50. Fo. 28: Ravenna. 44°40′ - 44°0′ N.; 11°57′ - 12°57′ E. 6 colors, 1908.

[Fo. 22 covers hardly any Italian territory—mainly parts of the French Alps.

For references to the editions of the official map of Italy listed under (a), (b), and (c) see "New Maps" under "Italy," *Bull.*, Vol. 43, 1911, p. 960. Index maps of the above 1:100,000 and 1:200,000 editions listed as (b) and (c) under "Italy and Colonies," *Bull.*, Vol. 44, 1912, No. 2, p. 159.]

NORWAY. Le Folgefonn (Norvège). [1:345,000]. [60°16′ - 59°50′ N.; 6°0′ - 6°40′ E. Accompanies, as Fig. X, "Revue de Glaciologie. No. 3" by C. Rabot, *Mém. de la Soc. fribourgeoise des Sci. Nat.: Géol. et Géogr.*, Vol. 5, 1909.

SCOTLAND. Bartholomew's "Quarter-Inch to Mile Map" of Scotland (Reduced from Bartholomew's Half-Inch Map). 1:253,400. Sheet 1: Sutherland & Caithness. 58°41′ - 57°33′ N.; 5°57′ - 2°57′ W. 13 colors. Sheet 2: Inverness & Skye. 57°43′ - 56°41′ N.; 7°20′ - 4°15′ W. 14 colors. Sheet 3: Aberdeen & Grampians 57°43′ - 56°41′ N.; 4°30′ - 1°45′ W. 14 colors. John Bartholomew & Co., Edinburgh. Price of each sheet, folded between cardboard covers, 1/6.

[Three sheets, comprising the northern half of Scotland, of a new seven-sheet map of Scotland based on the well-known map of Scotland in twenty-nine sheets published by the same firm. With its representation of relief in ten to eleven colors and of roads in red and its legible nomenclature, the map admirably meets the requirements both of the automobilist, for which it is specially intended, and of the geographer. It is such maps as these that have familiarized the general public in the United Kingdom with the nature of good cartography. See also comment under England, *Bull.*, Vol. 43, 1911, p. 958.]

WORLD AND LARGER PARTS

EASTERN MEDITERRANEAN. Tripolis und das-östliche Mittelmeer, der Schauplatz des italienisch-türkischen Konfliktes. 1:3,500,000. 46° - 29° N.; 5° - 38° E. 14 colors. With two insets: (1) Das Vilajet Tripolis und das Mutessariflik Bengasi. 1:7,500,000. 35°-23° N.; 9°-25° E. 5 colors. (2) Die Befestigungen der Stadt Tripolis und ihre Oase, die Mnschia. 1:125,000. [33° N. and 31 ²/₅° E.]. 4 colors. Justus Perthes, Gotha, 1911. Price 1 mark.

[Shows routes of Italian mail steamers].

EURASIA AND EASTERN AFRICA. (a) Verbreitung und Intensität des Reisbaus auf der Erde. Entworfen von Dr. C. Wachmann. Mercator's projection: equatorial scale 1:100,000,000. 4 colors.

(b) Verbreitung und Intensität des Reisbaus in Asien. Entworfen von Dr. C. Wachmann. 1:30,000,000. 70° N. - 10° S.; 20° [10° W.] - 150° E. 8 colors.

Taf. 3 and 4, "Die geographische Verbreitung des Reisbaus und seine Intensität in den Monsunländer" by C. Wachmann, *Pet. Mitt.*, Vol 58, I, Jan. 1912, pp. 15-26.

[Map (a) shows polar limits and degree of intensity of the rice cultivation of the world. Map (b) indicates, for areas where statistics are available, six degrees of intensity of rice cultivation and, where not, two degrees. Distribution is based mainly on political and not on natural boundaries. The color scheme, too, is ill-suited to express gradational sequence.]

LAND HEMISPHERE, PART OF THE. The Journey Round the World. [1:80,000,000]. 1 color. With: Comparative Diagram of Distances. Accompanies on front inside cover, "The Full Recognition of Japan" by R. P. Porter, London etc., 1911.

MEDITERRANEAN REGION AND THE NEARER EAST. (a) The Old Testament World. [1:26,000,000]. 44° - 10° N.; 10° W. - 65° E. 4 colors.

(b) The Main Highways of the Ancient Semitic World. [1:6,600,000]. 37° - 28½° N.; 30⅓° - 47° E. 1 color.

(c) The Main Highways of the Roman Empire and the Scenes of Paul's Work. [1:9,500,000]. 43° - 30 N.; 12° - 37° E. 1 color.

Accompany, facing pp. 3, 73 and 82, respectively, "Biblical Geography and History" by C. F. Kent, New York, 1911.

[Map (a) distinguishes between fertile land, arid steppe and desert].

NORTHERN EURASIA. The Siberian Railways, [1:25,000,000]. 78° - 36° N.; 13° - 160° E. 2 colors. Accompanies, facing p. 760, "The Full Recognition of Japan" by R. P. Porter, London, etc., 1911.

[Distinguishes between railroads opened, building, and projected, and shows section of the Trans-Siberian Railway to be double-tracked by 1912. Distances of principal places from Ostende given.]

WORLD. Der Salzegehalt an der Oberfläche der Meere im Verhältnis zur Süsswasserzufuhr der Stromgebiete und zur Höhe der Randegebirge. Mercator's projection: equatorial scale 1:80,000,000. 9 colors. Taf 2, "Der Salzegehalt der Meere und seine Ursachen" by A. Woeikow, *Pet. Mitt.*, Vol. 58, I, Jan , 1912, pp. 5-8.

[Shows the extent of the drainage basins of the Atlantic (including the Arctic Mediterranean), the Pacific and the Indian Ocean, and also the axes of the principal marginal mountain systems, indicating diagrammatically their mean altitude. The values for salinity are generalized from Schott's standard map, "Die Verteilung des Salzegehalts im Oberflächenwasser der Ozeane," Mercator's projection, equatorial scale 1:80,000,000, Taf. 19, *Pet. Mitt.*, Vol. 48, I, 1902.]

WORLD. Planisphère. Feuille 11: Bassin du Pacifique. 76° N. - 57° S.; 80° E. - 33° W. 11 colors. Feuille 11: Océan Atlantique et Océan Indien. 76° N. - 57° S.; 90° W. - 18° E. 11 colors. Both sheets on Mercator's projection. equatorial scale 1:50,000,000. Plates 1 and 2, Atlas Universel de Géographie par Vivien de Saint-Martin et Fr. Schrader. Hachette et Cie , Paris.

[Less individual than the majority of the often remarkable sheets of this atlas. The usual type of map of the world on Mercator's Projection showing political subdivisions, divided, however, into hemispheres allowing of a continuous representation of the Pacific and Atlantic Oceans. Plate 1 incorrectly shows Yap (9°30′ N. and 138°15′ E.) of the Caroline Islands, instead of Guam, as belonging to the United States.]

HISTORICAL

BRAZIL. Captaincy of S. Vicente in 1553. (After a map of that time [Brasiliæ Pars: Capitania S. Vincentii Cum adjacentibus. 1553-1597]). [1:2,700,000 approx.]. [22¾° - 25¼° S.; 50° - 43° W.]. Accompanies, on p. 17, "Brazil: Its natural riches and industries," Vol I, Comm. d'Expans. Econ. do Brazil, Paris, 1910.

BRAZIL. [Seven facsimile maps of places figuring in Brazilian history:]

(a) Plan of Bahia. Arrival of the portuguese [*sic*] fleet on the 29th of March 1625, to chase the Dutch. (After a dutch [*sic*] engraving). [14° S. and 38½° W.].

(b) Attack on Pernambuco by the Dutch in 1630. (After a Dutch engraving). [8° S. and 35° W.].

(c) Plan of Parahyba in 1634. (After a dutch [*sic*] engraving of 1635: [Afbeelding der Stadt en Fortressen von Parayba]). [7° S. and 35° W.].

(d) Plan of Cape Santo-Agostinho harbor in 1636. (After an old engraving). [8°21′ S. and 34°56′ W.].

(e) Rio de Janerio harbour.—Position of the belligerents on the 12th of September 1711. (After an old map). [1:106,000]. [22°54′ S. and 43°10′ W.]. Oriented N. 102° E.

(f) Map of *Rio Grande do Sul* showing the position of the belligerents before the battle of the 1st of april [*sic*] 1776, which compelled the Spaniards to give up this region. [1:180,000?]. 32° S. and 52° W.).

(g) Plan of the colony of Sacramento in 1777. (After a map of the time). [1:9,000]. [20° S. and 4° W.?].

Accompany, on pp. 27, 28, 30, 32, 39, 45 and 47, respectively, "Brazil: Its natural riches and industries," Vol. I, Comm. d'Expans. Econ. do Brazil, Paris, 1910.

MEXICO-UNITED STATES. Earliest Map showing Cibola-Zuñi [by Domingo del Castillo, 1541]. [1:24,000,000]. [Approx.: 37° - 15° N.; 116° - 95 W.]. [Facsimile]. Accompanies, facing p. 120. "The Leading Facts of New Mexican History," Vol. I, by R. E. Twitchell, Cedar Rapids, Ia., 1911.

WORLD. Division of the world *to be discovered* between the Portuguese and the Spaniards, by the treaty of Tordesillas (1494), confirmed by the Pope. [1:215,000,000]. Accompanies, on p. 43, "Brazil: Its natural riches and industries," Vol. I, Comm. d'Expans. Econ. do Brazil, Paris, 1910.

[Two hemispheres divided by the line of demarcation according to the second treaty (approximately 46° W.)].